

**PROPOSED AMENDMENTS TO THE  
STATEWIDE REGULATION TO REDUCE  
VOLATILE ORGANIC COMPOUND EMISSIONS  
FROM CONSUMER PRODUCTS  
- PHASE II -**

**STAFF REPORT**

**STATE OF CALIFORNIA  
AIR RESOURCES BOARD  
STATIONARY SOURCE DIVISION  
OCTOBER 1991**



State of California  
AIR RESOURCES BOARD

PROPOSED AMENDMENTS TO THE  
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FROM CONSUMER PRODUCTS  
- PHASE II -

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October 1991



State of California  
AIR RESOURCES BOARD

Staff Report: Initial Statement  
of Reasons for Proposed Rulemaking

Public Hearing to Consider  
PROPOSED AMENDMENTS TO THE STATEWIDE REGULATION  
TO REDUCE VOLATILE ORGANIC COMPOUND EMISSIONS  
FROM CONSUMER PRODUCTS  
- PHASE II -

To be considered by the Air Resources Board on December 12-13, 1991 at

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Air Resources Board  
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## TABLE OF CONTENTS

<u>Contents</u>	<u>Page</u>
I. <u>Introduction and Summary</u> .....	1
A. Overview.....	1
B. Summary.....	2
C. Recommendations.....	8
II. <u>Need for Emission Reductions</u> .....	9
A. Air Quality.....	9
B. Emissions.....	13
C. California Clean Air Act Requirements.....	14
III. <u>Product Descriptions and Summary of the Proposed Amendments</u> .....	15
A. Commercially and Technologically Feasible VOC Standards.....	15
B. Description of the Categories Proposed for Amendment.....	19
C. Proposed Standards and Standard Effective Dates.....	27
D. Emission Reductions.....	30
E. Methods of Complying with the Standards.....	32
F. Additional Amendments.....	33
IV. <u>Impacts Assessment</u> .....	39
A. Environmental Impacts.....	39
B. Economic Impacts.....	39
C. Small Business Impacts.....	41
V. <u>Phase I - Follow Up Issues</u> .....	42
A. Sell-Through Period for Non-Complying Products.....	42
B. Glass Cleaners.....	45
C. Bathroom and Tile Cleaners.....	46
D. Laundry Pre-Wash Products.....	46
E. Charcoal Lighter Material.....	47
VI. <u>General Issues</u> .....	49
A. Environmental Paths of VOC Emissions to the Atmosphere.....	49
B. Consumer Product Efficacy.....	51
C. Toxic Air Contaminants.....	52
VII. <u>Product Category Issues</u> .....	54
A. 1,1,1-Trichloroethane.....	54
B. Aerosol Disinfectants.....	57
C. Personal Fragrance Products.....	62
<u>Appendix</u>	

## LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Number of Days in Which the State Ambient Air Quality Standards Were Exceeded in Selected Air Basins During 1989.....	2
2	Ambient Air Quality Standards for Ozone and PM-10.....	10
3	VOC Emissions by Product Category (1990).....	14
4A	Summary of Products Which Comply with the Proposed Standards (1/1/95).....	18
4B	Summary of Products Which Comply with the Proposed Standards (1/1/97).....	19
5	Table of Standards (Phase II).....	28-29
6	Summary of Proposed Standards and Emission Reductions.....	30
7	VOC Emissions Reductions from All Consumer Products Regulations.....	31
8	Definitions Proposed for Addition.....	34
9	Definitions Proposed for Modification.....	34
10	Definitions Proposed for Deletion.....	35
11	Comparison of Cost Effectiveness of the Proposed Amendments to the Consumer Products Regulation with Cost Effectiveness of the Control Measures for Criteria Pollutants.....	41
12	Toxic Air Contaminants Identified by ARB.....	53

## LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	Area Designation for State Ambient Air Quality Standard - Ozone.....	11
2	Area Designation for State Ambient Air Quality Standard - PM10.....	12
3	Typical Sell-Through Period for Stores Having Sales Less Than \$3,500,000 - Air Resources Board Retail Store Survey.....	44
4	Typical Sell-Through Period for Stores Having Sales Less Than \$500,000 - Air Resources Board Retail Store Survey.....	45
5	Vapor Pressures of HFC-152a/Ethanol/Water Solutions at 70 °F.....	61



## I.

### INTRODUCTION AND SUMMARY

#### A. OVERVIEW

This report presents the staff's recommendations for a second phase of standards to reduce Volatile Organic Compound (VOC) emissions from consumer products sold in California. Standards are proposed for 12 new categories of consumer products and several amendments are proposed to the existing regulations for consumer products. These proposed standards and amendments are designed to meet the requirements of the California Clean Air Act (the "Act," Stats. 1988, Chapter 1568).

Two regulations have been adopted by the Air Resources Board (ARB or the "Board") to fulfill the requirements of the California Clean Air Act as it pertains to consumer products. On November 8, 1989, the Board approved a regulation to reduce volatile organic compound (VOC) emissions from antiperspirants and deodorants. On October 11, 1990, the Board approved a second, more comprehensive, regulation (Phase I) to reduce VOC emissions from 16 consumer products.

These two adopted regulations address 17 of the numerous categories of consumer products subject to the Act. To achieve the maximum feasible reduction in VOCs from consumer products as required by law, it is necessary to examine the potential for emission reductions from additional consumer product categories. In the year subsequent to the Board action in October 1990, ARB staff conducted a survey of consumer products and conducted technical investigations to determine if there were additional product categories that could contribute to emission reductions. Based on the findings, staff are proposing to amend the statewide comprehensive regulation to add standards for 12 new categories (Phase II). Additionally, staff are proposing several amendments to the existing regulation to clarify and improve the regulation.

B. SUMMARY

1. Why does the ARB need to regulate VOC emissions from consumer products further?

a. **Ambient Air Quality:** California continues to have severe air quality problems and emissions from consumer products contribute to these problems. The state ambient air quality standards for ozone and particulate matter less than 10 microns equivalent aerodynamic diameter (PM10) are widely exceeded throughout California. Table 1 shows the number of days in 1989 that the state standards for ozone and PM10 were exceeded in California's major air basins.

Table 1

Number of Days in Which the State Ambient Air Quality Standards  
Were Exceeded in Selected Air Basins During 1989

Number of Days Standard Exceeded		
Air Basin	Ozone	PM10
South Coast	211	306
San Francisco	22	95
San Diego	158	136
Sacramento Valley	67	144
San Joaquin Valley	148	274

Source: 1989 ARB California Air Quality Data Summary, Vol. XXI.

b. **Emissions:** Consumer products are a significant source of VOC emissions in California. Consumer products are widely distributed goods that contain varying quantities of VOCs. While the emissions from any one product may appear small, when combined in the aggregate, the emissions contribute significantly to California's air quality problems. Based on the 1987 emission inventory, consumer products account for approximately 10 percent of the total non-vehicular VOC emissions in the state, or about 200 tons per day.

c. **California Clean Air Act:** In 1988, the Legislature enacted the California Clean Air Act to address the air pollution problems of California. In the Act, the Legislature declared that attainment of the California State health-based air quality standards is necessary to protect public health, particularly of children, older people, and those with respiratory diseases. The Legislature also directed that these standards be attained by the earliest practicable date.

The Act added section 41712 to the California Health and Safety Code, which requires the Board to adopt regulations to achieve the maximum feasible reduction in reactive organic compounds (ROG or VOC - for purposes

of this regulation, ROG = VOC) emitted by consumer products, if the Board determines that adequate data exists for it to adopt the regulations, and if the regulations are technologically and commercially feasible and necessary. In enacting section 41712, the Legislature clearly gave the Board new authority to control emissions from consumer products, a category of sources that had not previously been subject to air quality regulations.

As defined in section 41712, consumer products are any chemically formulated product used by household and institutional consumers including but not limited to, detergents; cleaning compounds; polishes; floor finishes; cosmetics; personal care products; home, lawn, and garden products; disinfectants; sanitizers; and automotive specialty products. The definition of consumer products specifically does not include paint, furniture coatings, or architectural coatings.

## 2. What is being proposed?

The Phase I consumer products regulation currently sets forth VOC standards and effective dates for 16 categories of consumer products. The staff is now proposing to add new regulatory standards and effective dates for an additional 12 categories of consumer products. These categories (identified as Phase II) are:

Aerosol Cooking Sprays	Fabric Protectants
Automotive Brake Cleaners	Hand Dishwashing Detergents
Carburetor-Choke Cleaners	Household Adhesives
Charcoal Lighter Material	Insecticides
Disinfectants (Aerosol)	Laundry Starch Products
Dusting Aids	Personal Fragrance Products

Certain of these categories are further divided into subcategories for which separate VOC content limits are proposed.

In addition to proposing standards for 12 new categories of consumer products, the staff proposes a number of other modifications. These modifications include: (1) changes and additions to the definitions set forth in the regulation, (2) changes in some of the exemptions that are provided, (3) clarifications to the language of the innovative products provision, (4) changes to the specified test methods, (5) inclusion of more explicit registration requirements, and (6) various other changes to the existing regulatory language. The modifications are also proposed to the test methods and innovative products provisions of the antiperspirant and deodorant regulation, in order to provide consistency with the proposed changes to the consumer products regulation. A copy of the proposed amendments is included in the appendix.

The staff is continuing to have discussions with manufacturers of consumer products subject to this staff proposal. To the extent these discussions result in the need to modify the proposal, the staff will present such changes at the hearing. Specifically, representatives of the personal fragrance industry have presented staff with an alternative proposal to what is being proposed by staff. Unfortunately, the proposal



was presented to the staff as this report was being finalized. The staff intends to evaluate the industry proposal and may have specific modifications at the hearing to the proposal contained herein for personal fragrance products.

3. What are the emission reductions from the staff proposal?

Total estimated emissions from the 12 product categories being proposed for inclusion in the consumer products regulation are estimated to be 57,000 pounds per day (lbs/day). If the Phase II amendments are adopted, the emission reductions that would be achieved are approximately 19,300 lbs/day by January 1, 1999. This reduction represents about a 30 percent reduction of the emissions from the products being proposed for control. When these potential reductions are added to the reductions to be achieved as a result of the Phase I consumer product regulation and the deodorant and anti-perspirant regulation, the total reductions of VOC emissions from consumer products are approximately 118,300 lbs/day (about 60 tons per day), or about a 30 percent overall reduction.

4. Are the proposed standards technologically and commercially feasible?

The standards proposed are technologically and commercially feasible. Currently there are products available in each product category proposed for control which comply with the proposed standards. Thus, the basic market demand for these products will be ensured and the impact on the consumer products market and the product choices available to the consumer will be minimized. To achieve further emission reductions, additional future effective standards are being proposed for some consumer product categories. For those products that have future effective standards, staff will work closely with industry to monitor the progress in developing the new products to meet the lower VOC limits.

5. What are the economic impacts of the proposed regulation?

The cost effectiveness ratios for the proposed regulation range from less than \$0.01 to \$1.04 per pound of VOC reduced. The lower cost effectiveness ratio was calculated assuming that manufacturers would reformulate a product to a similar product with no equipment change over. The higher cost effectiveness ratio assumes that a product is reformulated and requires change in production equipment. The assumption was also made that manufacturers would market the reformulated product nationally. This range reflects the staff's best estimate based on the data available to allow evaluation of the cost to all manufacturers and the uncertainty in the cost to reformulate from the wide variety of products covered under the regulation. Due to the complexity of the market it is not possible to conduct individual analysis for each consumer product.

The total annual cost to the entire consumer product industry is estimated to range from approximately 13 to 205 million dollars. The estimated average annual costs associated with reformulating a single product formulation to meet the proposed regulation range from \$15,600 to \$270,000 per product.

6. What are the environmental impacts of the proposed standards?

The proposed amendments limit the amount of VOCs in consumer products. The primary environmental impact will be a decrease in VOC emissions to the environment from consumer products. Since VOCs are involved in the formation of tropospheric ozone, any reduction in VOC emissions is expected to result in a positive impact on air quality and public health.

No adverse environmental impacts from the implementation of the proposed regulation have been identified. The staff took into consideration the impacts of the proposed amendments on stratospheric ozone depletion, global warming, water pollution, toxic air contaminants and landfill loading.

7. What are staff proposals on the October 1990 Board Directives?

During the October 1990 Board Hearing, at which the Board approved the consumer product regulation (Phase I), several issues were raised by industry representatives regarding the regulation. The Board directed staff to address specific issues and report back to the Board in 1991. The Board directed the Executive Officer, in ARB Resolution 90-60 (dated October 11, 1990), to: (1) gather additional data on the feasibility of a five percent VOC standard for laundry prewash (all other forms) and bathroom and tile cleaners; (2) study the issue of whether a longer sell-through period is necessary for small volume retailers of consumer products; and (3) survey the amount of VOC emissions from charcoal lighter fluid in the state and report on the appropriateness of control.

Over the past year, staff has met with industry representatives to discuss the issues raised at the Board hearing and has conducted the consumer product VOC survey which included requests for data on laundry prewash, aerosol bathroom and tile cleaners and charcoal lighter fluid. Based on staff's analysis of the data, staff recommend that the standard for aerosol bathroom and tile cleaners be raised from 5 percent to 7 percent, and that no change be made to the laundry prewash standard. Charcoal lighter fluid emissions were determined to be approximately 5,600 lbs/day statewide in California on a yearly basis or about 11,200 lbs/day if based on peak summer season emissions. Based on this data, the staff is proposing control of these emissions.

8. How does staff provide assurance that there will not be a health problem from compliance with the standard for aerosol disinfectants?

The staff has determined that the 60 percent standard proposed for aerosol disinfectants is technologically and commercially feasible and that at a VOC content of 60 percent manufacturers can provide intermediate level (i.e., hospital level disinfectants that are tuberculocidal, fungicidal, and can kill most viruses) aerosol disinfectants. In response to concerns raised by manufacturers, the Staff intends to recommend to the Board that the ARB follow a policy which will guarantee that fully effective aerosol disinfectants remain available to the public. If subsequent information shows that these disinfectants can not simultaneously meet the proposed

standard and kill or deactivate a group of target organisms, the standard will be modified accordingly. In determining what possible impacts the standard may have on the health benefits of these products, both ARB and DHS staff will evaluate the effectiveness of products formulated to comply with the standard and achieve intermediate-level, hospital disinfection according to the products' ability to kill or inactivate Staphylococcus aureus, Salmonella choleraesuis, Pseudomonas aeruginosa, Mycobacterium tuberculosis var. bovis, Trycophyton mentagrophytes, and any target organism or organisms which the EPA determines by notice in the Federal Register as a general-purpose virucidal indicator(s) for showing activity against most hydrophilic and/or lipophilic viruses. ARB and DHS staff will jointly report to the Board on the progress of manufacturers in developing complying products which meet this criteria. If it is determined that the VOC limit proposed by staff will not allow formulation of aerosol disinfectants which can achieve intermediate level hospital disinfection, then the staff will make appropriate recommendations to the Board to modify the standard to ensure that the public will continue to have aerosol disinfectants that can kill or inactivate the target organisms.

9. How will these amendments affect the goals outlined in the Consumer Product Control Plan?

The Consumer Product Control Plan presented to the Board in July 1989, established a goal of a 50 percent reduction of VOC emissions by the year 2000. The staff estimates that the antiperspirant and deodorants regulation will result in a VOC reduction of 8,000 lbs/day, and the Phase I statewide comprehensive regulation 90,000 lbs/day. The standards proposed in Phase II will result in an estimated additional VOC reduction of 19,300 lb/day, bringing the total close to 118,300 lbs/day or approximately a 30 percent reduction in VOC emissions from consumer products. The staff intends, as discussed below, to evaluate further additional opportunities for emission reductions from consumer products.

10. What is planned for the future?

The staff plans to investigate the potential for further emission reductions from consumer products. Several categories of emission sources were not addressed at this time due to lack of resources or information. If the staff determines that it is commercially and technologically feasible to reduce emission from these categories, staff will propose additional standards at a later date.

One of the objectives for this year's amendments to the regulation was to include an alternative compliance plan (ACP) system for manufacturers. The purpose in pursuing an ACP is to use market incentives to provide further flexibility to the industry in complying with this rule. However, due to resource limitations, the ACP was not fully developed in time for consideration by the Board this year. The staff are continuing to develop proposed regulatory language for an ACP program and are committed to continue working with consumer products manufacturers to develop an ACP that will provide flexibility to manufacturers, be enforceable, and be equitable.

The ACP presently under development and the Innovative Products provision adopted by the Board last year, are two alternative means to add flexibility to a traditional "command and control" regulation. Due to the complexity of the consumer products market and the limitations on our resources, it is becoming clear that other methods to reduce emissions must be explored. In 1992, as the staff continues to develop the ACP, other regulatory approaches such as the use of economic incentives, labeling and educational programs will also be evaluated to determine if these have merit for use to maximize emission reductions from consumer products.

#### 11. How did staff develop this report?

The Act requires the Board to adopt regulations for consumer products only if adequate data exists. Several steps have been taken to obtain the necessary information on which to base the proposed amendments. A survey of consumer products was conducted this spring to collect product formulation and production data on 49 different consumer product categories. The information obtained was then used to prioritize the product categories for control. Information requested in the survey included the following data for each brand name marketed in California: (1) the product form and function, (2) the annual California sales, (3) the product composition, and (4) for aerosol products, the propellant content and composition. A detailed summary of the results of the survey can be found in the Technical Support Document (TSD). Using the results from the survey, ARB staff estimated VOC emissions from each product category and identified products with low VOC emissions. In setting priorities, staff considered the magnitude of emissions, information available in the literature, and the potential for emission reductions. The initial staff proposal contained 30 new product categories. Based on discussions with consumer product manufacturers at 3 public workshops and numerous individual meetings, staff modified the original proposal and have postponed consideration of 18 product categories pending further study.

In addition, a survey was conducted of over 7,000 health care facilities in California, including hospitals, nursing homes, day care facilities, veterinary hospitals and dental offices. This survey was conducted to determine the disinfectant needs of the health care community. Staff have also coordinated the development of the amendments with the Department of Health Services and the Department of Pesticide Regulation.

At the Board's request, staff also conducted an investigation to determine the impact on small retailers in California of the 1 year sell through provision, approved by the Board last year. To determine the effect, staff conducted a survey of over 4,000 retail businesses in California.

The information collected by staff from the surveys, workshops, and industry meetings provided adequate data on which to base this staff proposal. This report is accompanied by a TSD also prepared by ARB staff. The TSD contains detailed discussions of the information presented here.

### C. RECOMMENDATIONS

Staff recommends that the Board amend as appropriate the following sections of Title 17 of the California Code of Regulations:

- Section 94507 - Applicability
- Section 94508 - Definitions
- Section 94509 - Standards
- Section 94510 - Exemptions
- Section 94511 - Innovative Products
- Section 94513 - Registration
- Section 94515 - Test Methods

In order to achieve consistency with these proposed amendments, the staff also recommends that the Board amend sections 94503.5 (Innovative Products) and 94506 (Test Methods) of the antiperspirant and deodorant regulation.

The proposed amendments are technologically and commercially feasible and necessary to carry out the Board's responsibilities under Division 26 of the Health and Safety Code. Staff will periodically report back to the Board on the implementation status of the regulation. Staff intend to closely monitor industry efforts at meeting the technology-forcing limits, and will also report to the Board on industry's progress.

## II.

### NEED FOR EMISSION REDUCTIONS

#### A. AIR QUALITY

In order to protect California's population from the harmful effects of ozone and PM-10 (particulate matter less than 10 microns equivalent aerodynamic diameter), federal and state air quality standards for these contaminants have been established. These standards are shown in Table 2. The state hourly ozone standard is 0.09 parts per million (ppm) and the national hourly ozone standard is 0.12 ppm. The state PM-10 standard for a 24 hour period is 50 micrograms per cubic meter ( $\text{ug}/\text{m}^3$ ) and the national standard is  $150 \text{ ug}/\text{m}^3$ , determined over a 24-hour period.

Ozone formation in the atmosphere results from a series of chemical reactions between volatile organic compounds (VOCs or ROGs) and nitrogen oxides ( $\text{NO}_x$ ) in the presence of sunlight. PM-10 levels are the result of both direct and indirect emissions. Direct sources include emissions from fuel combustion and wind erosion of soil. Indirect PM10 ambient levels result either from the chemical reaction of VOCs, nitrogen oxides, sulfur oxides and other chemicals in the atmosphere or the condensation of such gases that are emitted.

Today, over 90 percent of California's population live in areas that are non-attainment for both the state ozone and PM-10 standard. Figure 1 is a map showing the attainment status of California's air basins and counties with regard to the ambient air quality standards for ozone. The lined and cross-hatched areas represent the 32 counties that are designated non-attainment for the state ozone standard. Figure 2 is a map showing the attainment status for California air basins and counties with regard to the state ambient air quality standard for PM-10. As shown in the map, 13 air basins or portions thereof, covering 50 counties have been designated non-attainment for PM-10.

TABLE 2

## Ambient Air Quality Standards for Ozone and PM-10

Pollutant	Averaging Time	State Standard	National Standard
Ozone	1 hour	0.09 ppm (180 ug/m <sup>3</sup> )	0.12 ppm (235 ug/m <sup>3</sup> )
PM-10	Annual Geometric Mean	30 ug/m <sup>3</sup>	- - -
	24 hour	50 ug/m <sup>3</sup>	150 ug/m <sup>3</sup>
	Annual Arithmetic Mean	- - -	50 ug/m <sup>3</sup>

Figure 1

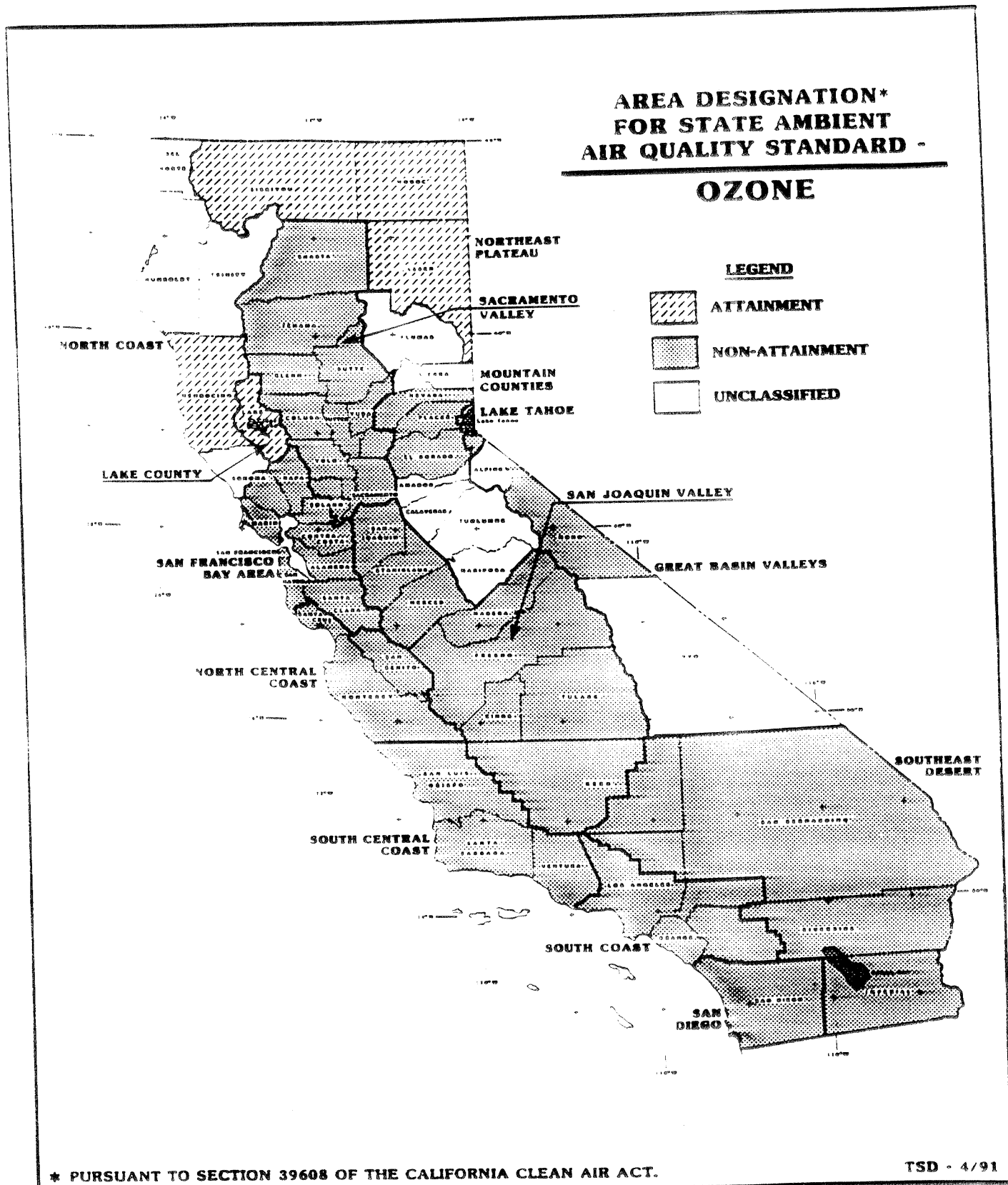
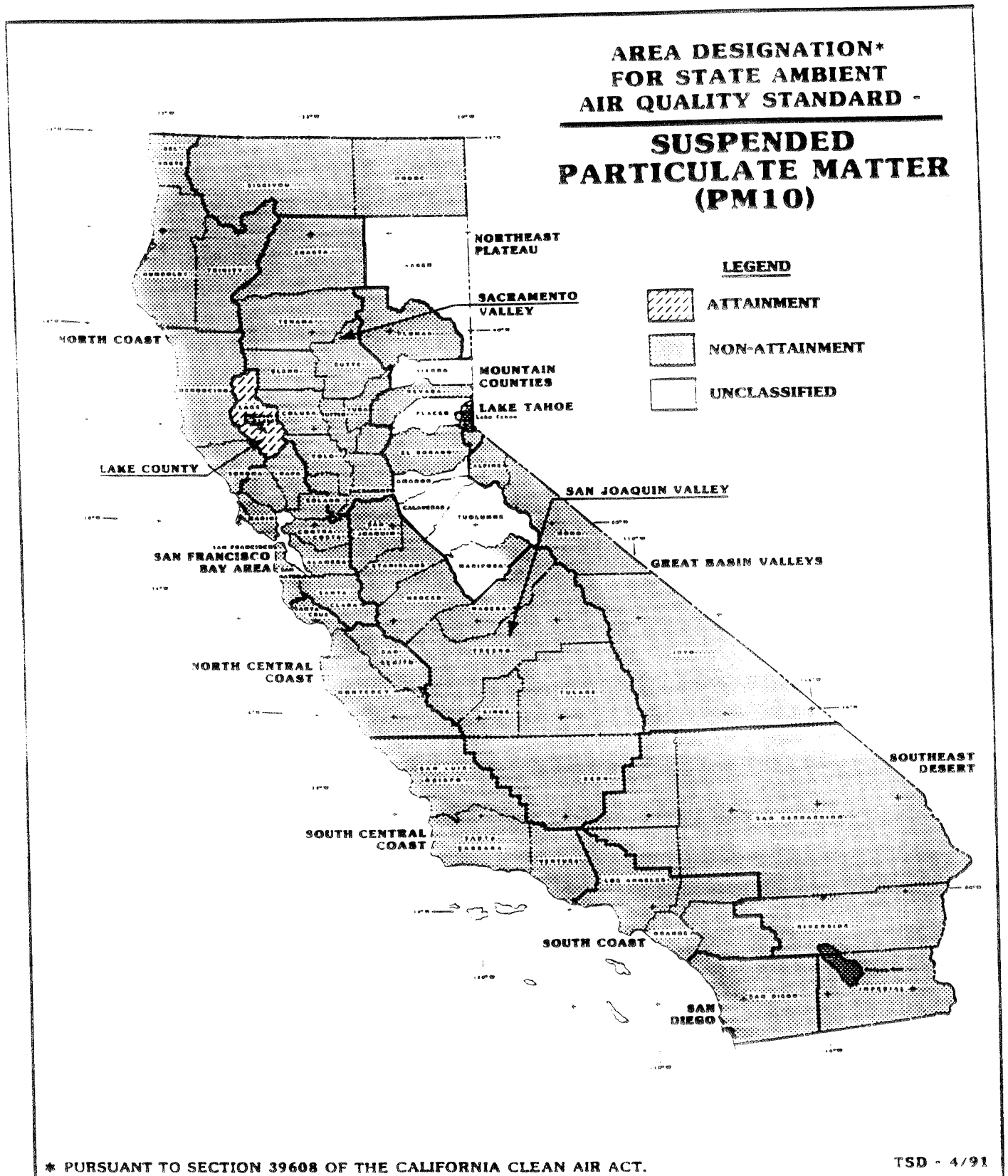




Figure 2



## B. EMISSIONS

Health and Safety Code section 41712 requires the Board to achieve the maximum feasible reduction in reactive organic compounds emitted by consumer products. As defined in the regulation, VOCs are reactive organic compounds. VOCs are defined as any compound containing at least one atom of carbon, except methane, carbon dioxide, and certain other organic compounds determined by the Environmental Protection Agency (EPA) and the ARB to be non-photochemically reactive.

While all VOCs are potential contributors to air pollution, the staff are also aware that some VOCs used in consumer products have very low vapor pressures, and due to the product formulation characteristics and product use, do not contribute to as great an extent as the more volatile VOCs. Based on staff's evaluation of the consumer products being proposed for control, the regulation provides that only those compounds that exert a vapor pressure greater than 0.1 mm Hg when measured at 20 degrees Centigrade will be counted toward the emission estimates.

The emissions from all consumer products are estimated to be about 200 T/D in 1987 (excluding aerosol paints) and account for approximately 10 percent of all the non-vehicular VOC emissions in California. This is a significant source of VOC emissions and if not regulated the percentage contribution to the total smog-forming emissions will increase as California's population continues to grow and the emissions from automobiles and factories are increasingly regulated.

The estimated emissions of VOCs from the 12 consumer products being proposed for regulation were over 57,000 lbs/day (28.5 T/D) statewide in 1990. The emissions from these products are summarized in Table 3. The emissions from these products account for approximately 15 percent of the total consumer product emissions. Insecticides are the largest category being proposed for control at 18,500 lbs/day followed by personal fragrance products at 10,900 lbs/day. These emissions estimates were calculated based on the responses to the VOC consumer products survey conducted by ARB staff in the spring of 1991 to determine VOC emissions for these and other products.

Table 3

VOC Emissions by Product Category  
(1990)

<u>Product Category</u>	<u>VOC Emissions lbs/day</u>
Aerosol Cooking Spray	1,500
Automotive Brake Cleaners	1,600
Carburetor Choke Cleaners	3,300
Charcoal Lighter Fluid	5,600
Disinfectants (Aerosol)	7,600
Dusting Aids	1,000
Fabric Protectants	440
Hand Dishwashing Detergents	800
Household Adhesives	2,400
Insecticides	18,500
Laundry Starch Products	3,400
Personal Fragrance Products	<u>10,900</u>
Total: 57,000 lbs/day (28.5 T/D)	

Source: ARB 1991 Consumer Product Survey

### C. CALIFORNIA CLEAN AIR ACT REQUIREMENTS

The California Clean Air Act (CCAA) of 1988 requires, in part, (Health and Safety Code section 41712) that on or before January 1, 1992, that the ARB adopt regulations to achieve the maximum feasible reduction of reactive organic compound emissions from consumer products. Section 41712 also provides that the Board shall not adopt regulations unless the regulations are technologically and commercially feasible and are necessary.

The California Clean Air Act further requires that each district that is nonattainment for the state air quality standard for ozone, carbon monoxide, sulfur dioxide, or nitrogen dioxide to develop a plan for attaining and maintaining the standards by the earliest practicable date and to achieve a reduction in districtwide emissions of 5 percent or more per year for each nonattainment pollutant or its precursors.

As described in this staff report, consumer products are a significant source of VOC emissions in California. The VOCs used in consumer products are photochemically reactive and contribute to the state ozone and PM-10 problem. Because of the serious air quality problems in California and the inability of most populated areas to meet the state and federal standards for ozone and PM-10, it is necessary to regulate consumer products and achieve emission reductions from this solvent source category to the maximum extent feasible.

### III.

#### PRODUCT DESCRIPTIONS AND SUMMARY OF THE PROPOSED AMENDMENTS

##### A. COMMERCIALY AND TECHNOLOGICALLY FEASIBLE VOC STANDARDS

Health and Safety Code Section 41712 requires that all consumer product regulations adopted by the Board must be technologically and commercially feasible. Last year, during the development of Phase I consumer product standards, staff established criteria that were used to develop VOC limits that would meet these statutory standards. Staff has used the same criteria during the development of the Phase II proposal.

In general, staff took the view that within a given product category, products that perform similar functions should not have large differences in VOC content. The underlying question is, "If other products have a low VOC content, while performing similarly, why is this manufacturer not able to do the same or better?" For all of the product categories proposed for regulation, there exist complying products currently on the market. This fact creates a strong presumption that the proposed standards are technologically and commercially feasible. Further discussion of these concepts is presented below.

##### 1. Commercially Feasible

The term "commercially feasible" is not defined in the Health and Safety Code. In interpreting this term, the staff has utilized the reasoning employed by the United States Court of Appeals for the District of Columbia in interpreting the federal Clean Air Act. In the leading case of International Harvester Company V. Ruckelshaus, (D.C. Cir. 1973) 478 F.2d 615, the Court held that the Environmental Protection Agency could promulgate technology-forcing motor vehicle emission standards which might result in fewer models and a more limited choice of engine types for consumers, as long as the basic market demand for new passenger automobiles could be generally met.

Following this reasoning, the staff has concluded that a regulation is "commercially feasible" as long as the "basic market demand" for a particular consumer product can be met. While the proposed standards are

not expected to eliminate any product forms or types, the staff does not believe that the Legislature intended that manufacturers be guaranteed the right to sell consumer products in all the same variety of forms and types that presently exist. To adopt such a narrow interpretation would be inconsistent with the clearly expressed legislative intent that "...the state board shall adopt regulations to achieve the maximum feasible reduction in reactive organic compounds emitted by consumer products..." (Health and Safety Code section 41712(a)).

Some commenters have expressed the view that consumers do not have a "basic market demand" for a general class of products, but that consumers instead have a number of a separate and distinct "basic market demands" for many specialty products with differing characteristics. In the category of "glass cleaners", for example, some glass cleaners are ammonia-based and some are vinegar-based. Under the views of some commenters, it might be inappropriate for the ARB to establish a single standard for glass cleaners (based on the "basic market demand" for "a product that will clean glass"), because such a standard may not take into account the separate market demand of some consumers for "ammonia-based glass cleaners" and the demand of other consumers for "vinegar-based glass cleaners". Similarly, it has been argued that separate "basic market demands" must be recognized for all forms of a product (i.e., aerosols, pumps, solids, gels, etc.), and that the ARB does not have the authority to set a VOC standard that would have the effect of eliminating any of the existing product forms.

ARB staff does not agree with this view. Every currently marketed product or product form has some unique features that differentiate it from other products. Consumers who purchase a particular product or product form have demonstrated a preference over competing products that they do not buy. However, a preference for a particular product form is not the same as the basic market demand for the function that the product performs. The International Harvester case, supra, clearly makes this distinction. In International Harvester, the court stated that the proposed emissions standards would be feasible even though they might result in the unavailability of certain kinds of vehicles and engine types which some consumers preferred (e.g., fast "muscle" cars), as long as the basic market demand for passenger cars could be generally met. Applying this principle to the area of consumer products, the proposed amendments allow the basic market demand to be met for products in each consumer product category, even though for some categories it may no longer be possible to manufacture certain product types or formulations. The ARB staff believes that this is a common sense approach which is in full accord with the requirements of section 41712.

Although the ARB is not legally compelled to do so, for many product categories an attempt has in fact been made to accommodate differing consumer preferences. This is reflected in those product categories for which separate VOC limits have been set for different product forms. The ARB will continue to use this approach in cases where it is both feasible and appropriate to do so, in light of all the data and comments presented during the regulatory process.

## 2. Technologically Feasible

The Health and Safety Code Section 41712(b) provides that the Board shall not adopt consumer product regulations unless the regulations are also "technologically feasible". Technological feasibility is a different concept than "commercially feasible", and does not take into account the cost of the product to be produced. Staff believes that a proposed standard is technologically feasible if it meets at least one of the following criteria: (1) the standard is already being met by at least one product within the same category, or (2) the standard can reasonably be expected to be met in the time frame provided through additional development efforts. For all of the categories being proposed for control, both the initial standards and the future effective standards, products are currently marketed that comply with the regulation. Tables 4A and 4B below lists the number of complying products for each Phase II product category.

Table 4A

Summary of Products Which Comply with the  
Proposed Standards (1/1/95)

Product Category	Product Form	Proposed Standard Wt % VOC (1/1/95)	Total # Products in Survey	Number of Complying Products Available in Calif.
Aerosol Cooking Sprays	All Forms	18	45	31
Automotive Brake Cleaners	All Forms	50	60	45
Charcoal Lighter Material	All Forms	0.02 lb/start	23	0
Carburetor Choke Cleaners	All Forms	75	69	24
Disinfectants	Aerosols	60	34	41
Dusting Aids	Aerosols All Others	35 7	28 19	15 12
Fabric Protectants	All Forms	75	66	59
Hand Dishwashing Detergents	All Forms	2	157	106
Household Adhesives	Aerosol All Others	75 10	58 250	45 166
Insecticides - Crawling Bug	All Forms	40	210	134
Flea and Tick	All Forms	20	39	23
Flying Insect	All Forms	30	64	15
Foggers	All Forms	40	62	13
Wasp & Hornet	All Forms	40	37	22
Lawn & Garden	All Forms	20	164	89
All Others	All Forms	20	129	51
Laundry Starch Products	All Forms	5	42	26
Personal Fragrance Products - Aftershave & Body Splashes	All Forms	60	198	58
Colognes, Toilet Water & Perfumes	All Forms	70	669	93
All Other	All Forms	50	45	16

\* UTQ - Unable to quantify

Note: Kingsford has recently qualified a charcoal lighter fluid to meet South Coast Air Quality Management District requirements and staff believe that this product will meet the proposed standards.

Table 4B  
Summary of Products Which Comply with the  
Proposed Standards (1/1/97)

Product Category	Product Form	Proposed Standard Wt % VOC	Total # Products in Survey	Number of Complying Products Available in Calif.
Carburetor Choke Cleaners	All Forms	50	69	15
Dusting Aids	Aerosol	25	28	9
Fabric Protectants	All Forms	60	66	59
Household Adhesives	Aerosol	25	58	12
Insecticides - Crawling Bug (1/1/98)	All Forms	20	110	99

## B. DESCRIPTION OF THE CATEGORIES PROPOSED FOR AMENDMENT

### 1. Aerosol Cooking Sprays

Aerosol cooking sprays are aerosol products designed either to reduce sticking on cooking and baking surfaces or are applied on food, or both. They are generally recognized as pan coating, pan release, food release, no-stick, or flavored cooking sprays that are used in professional and home settings. Professional settings may include restaurants, cafeterias, and mobile kitchens.

Generally, aerosol cooking sprays help to reduce sticking in foods and aid in the clean-up of food residues in cookware, bakeware, and utensils. In some cases, they are used as flavoring sprays. Healthwise, the aerosol cooking sprays benefit people who are on low-fat or restrictive diets because the cooking sprays contain little fat, are low in calories, and have no cholesterol. Since they are used as a processing aid in the cooking and baking of foods or as flavoring on foods, all listed ingredients must be "generally recognized as safe (GRAS)" for use by the Food and Drug Administration.

The key ingredient is lecithin because it has excellent emulsification properties, is a useful foam stabilizer and suspending



agent, has anti-spattering properties, and is a good release agent. Because of its reputation as a health food supplement, lecithin is used in fat-sparing formulations.

Based on the ARB VOC survey, 45 aerosol cooking sprays were reported. The estimated emissions for this category are 1,500 lbs/day.

## **2. Automotive Brake Cleaners**

Automotive brake cleaners are products designed to remove oil, grease, brake fluid, brake pad material or dirt from motor vehicle brake mechanisms. The solvents used in brake cleaners are used to remove contaminants from brake components such as soils, brake fluid, oils and greases and to ease disassembly or to provide final cleaning during assembly. Most brake cleaner formulations are based on chlorinated solvents that clean parts quickly without leaving a residue. A typical brake cleaning formulation will primarily consist of 1,1,1-Trichloroethane (methyl chloroform or TCA) and tetrachloroethylene (perchloroethylene) blends, while non-chlorinated brake cleaners may consist of toluene, acetone, xylene, terpenes, petroleum distillates, methanol and ethanol. The recent amendments to the federal Clean Air Act require the phase out of TCA. Because of this, it is expected that manufacturers will reformulate products containing TCA, such as brake cleaners, to remove TCA.

Brake cleaning products are packaged in aerosol and liquid form. Market shares for aerosol and liquid forms are 95 percent and 5 percent respectively. Total emissions for this category are 1,600 lbs/day.

## **3. Carburetor - Choke Cleaners**

Carburetor-choke cleaners are products designed to remove dirt and other contaminants from a carburetor, but do not include products designed to be introduced directly into the fuel lines or fuel storage tank prior to introduction into the carburetor. Carburetor-choke cleaners also remove dirt and other contaminants from such parts as butterfly valves and choke linkages.

Carburetor-choke cleaners are sold in both the aerosol and liquid forms. The aerosols are the most commonly used form because most carburetors are cleaned while still attached to the engine. All aerosols are sold with a thin straw-like plastic tube which inserts into the valve button orifice to allow for localized cleaning of the carburetor and its components. The liquids are usually used by professionals and home mechanics who clean, repair, or rebuild engine components. The liquid products may be sold in 2 gallon, 5 gallon, or larger sized containers (55 gallon drums). The liquid containers are usually not completely filled to allow head space for a dip basket. Generally, liquid carburetor parts cleaners are also used to clean other metal parts, whether the parts are engine components or not.

Carburetor-choke cleaners contain VOCs that are solvents and propellants. Typical aerosol formulations may include the following ingredients in various combination - methylene chloride, toluene, xylene, acetone, alcohol, ethyl acetate, butyl acetate, diacetone alcohol, methyl ethyl ketone, 2-butoxyethanol, isopropyl alcohol, 1,1,1-trichloroethane, methanol, morpholine and cyclohexanol. Propellants used include propane, isobutane, a combination of both, carbon dioxide, or dimethyl ether (DME).

Based on ARB's VOC survey, 69 carburetor-choke cleaners were reported. Of these, 53 are aerosols and 16 are liquids. The aerosols account for a greater portion of the market and the majority of the emissions. The emissions from this category are estimated to be 3,300 lbs/day.

#### 4. Charcoal Lighter Material

Charcoal lighter material is defined in the proposed amendments as any combustible material designed to be applied on, incorporated in, added to, or used with charcoal to enhance ignition. This does not include electrical starters and probes; metallic cylinders using paper tinder; natural gas; and propane. Charcoal lighter materials are perhaps unique among the categories included in the regulation in that (1) a large portion of the product is converted to non-VOC combustion by-products during usage, and (2) product usage tends to be very seasonal (summertime).

Products typically used to light barbecue charcoals include lighter fluids, paraffin cubes and wood chips, gels, "fire rings", (metallic rings filled with fluid to light charcoal from underneath), pre-soaked or "ready start" charcoal (essentially charcoal with lighter fluid already incorporated into it), and "bag-light" charcoal (small bags of charcoal which are lit with charcoal still in the bag). Tests conducted by the South Coast AQMD (SCAQMD) demonstrate that the majority of VOC emissions from this category results from the use of petroleum distillate-based charcoal lighter fluids (Haimov). These petroleum distillate-based products are comprised of 100 percent VOC, with physical and chemical properties similar to those of kerosene (Lieu).

Total sales of charcoal lighter material are estimated to be between 26,000 lbs/day (1991 ARB VOC Survey) and 30,000 lbs/day (Nielsen) in California. Of this total, source testing conducted by the SCAQMD and the Clorox Company show that approximately 20 percent of the product used either evaporates or is otherwise not consumed during combustion (Marinoff; Kennedy). From this data, staff estimate that the annual daily average VOC emissions from this category are approximately 5,600 lbs/day of VOC (based on assumed average sales of 28,000 lbs/day) in California. Since barbecuing may be more accurately described as a seasonal activity (assuming majority of emissions occur between May and October), staff also estimate summer daily average emissions to be approximately 11,200 lbs/day VOC (Perryman). Because

of the seasonal nature of barbecuing, staff expect that the summer daily average emissions estimate is a more accurate representation of the emissions which can impact ozone attainment strategies.

In October 1990, the SCAQMD adopted a regulation for charcoal lighter materials which limited maximum emissions from these products to 0.02 pound VOC per start. This regulation formed the basis for staff's proposed standard. To maintain consistency with this regulation, staff's proposed standard and administrative requirements for charcoal lighter materials are essentially identical to those adopted by the SCAQMD. In this way, impacts to manufacturers and consumers will be minimized while ensuring significant emission reductions and continued product availability throughout California.

## **5. Disinfectants (Aerosols)**

Disinfectants are defined as any product intended to destroy or irreversibly inactivate infectious or other undesirable bacteria, pathogenic fungi, or viruses on surfaces or inanimate objects. Since these products are intended to kill organisms, they are registered with the Environmental Protection Agency as pesticides under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA, 7 U.S.C. 136, et seq.) and with the California Department of Pesticide Regulation (formerly with California Department of Food and Agriculture) under the newly-formed California Environmental Protection Agency.

Aerosol disinfectants are used by consumers to kill germs on surfaces and to eliminate odors by killing household germs, mold, and mildew in and around the home. Typical areas of use include garbage cans, hampers, bathrooms, and pet areas.

Disinfectants are available in aerosol, liquid, powder, granule, pump, foam, and towelette forms (1991 ARB VOC Survey). Aerosol disinfectants basically contain four components: (1) solvents, (2) active ingredients, (3) propellants, and (4) other minor ingredients. The solvents, which can also act as an active ingredient, usually include an alcohol (ethanol or isopropanol) and water. In addition to alcohols, other active ingredients usually include a phenolic (e.g. o-phenylphenol) or a quaternary ammonium compound (quats). Propellants are either a liquefied hydrocarbon (isobutane, n-butane, propane) or a compressed gas (CO<sub>2</sub>).

Aerosol disinfectants dominate the household market, but their sales volume is insignificant when compared to liquids and solid disinfectants in the industrial/institutional (I&I) market. While aerosol disinfectants comprise less than 1 percent of the total combined household and I&I markets for disinfectants, they emit a disproportionately large 40 percent of the total VOC emissions from the disinfectant category (1991 ARB VOC Survey). Staff estimates emissions from aerosol disinfectants products to be approximately 7,600 lbs/day.

## 6. Dusting Aids

Dusting aids are products applied to dust cloths or dust mops to increase their ability to attract and hold dust particles. Some products are also used to clean surfaces such as wood paneling and stainless steel. These products differ from products in the furniture maintenance category in that they do not leave a wax or silicone based coating and can be used to dust floors. Typically a hydrocarbon oil is included in formulation as the primary dust attracting ingredient.

Dusting aids are composed primarily of light hydrocarbon oil and solvent, water or both. The solvent is typically hydrocarbon although some products contain methyl chloroform. Aerosols typically contain hydrocarbon propellants such as isobutane and propane. Other ingredients that may be added in small amounts are emulsifiers, cationic dust attractants, and fragrance.

Dusting aids are available in aerosol, pump spray, and liquid forms, with the majority of the market and emissions from the aerosol form. Emissions from the entire category are 1,000 lbs/day, with 97 percent of the emissions from the aerosol form.

## 7. Fabric Protectants

Fabric protectants are defined to include products designed to be applied to fabric substrates to protect the surface from soil, dirt, and other impurities. Excluded from the definition are waterproofing products and products labeled and marketed for use only on fabrics which are labeled for "dry clean only".

Fabric protectants are available for a variety of products such as clothing, outdoor equipment, furniture, and carpets. Fabric protectants are typically sprayed onto the surface and allowed to dry. The solvents in the product evaporate, leaving behind a resin film which forms a barrier between the fabric and soil. Most of these products use fluoropolymer resin dissolved in 1,1,1-Trichloroethane. Aerosol products typically contain hydrocarbon or carbon dioxide as the propellant.

Fabric protectants are available in aerosol, liquid, and pump forms. Of these, the aerosol sprays dominate the California market. Emissions from this category are estimated to be 440 lbs/day.

## 8. Hand Dishwashing Detergents

Hand dishwashing detergent is a surfactant-based washing product designed for hand dishwashing or other light cleaning tasks. The products are designed to be able to handle food soils, be mild on hands, create high and long lasting suds, and rinse free of films and spots. Almost all hand dishwashing detergents are liquids with the exception of some powder products for the I & I market. Liquid

products are aqueous blends of surfactants and powder products contain surfactants, sanitizing agents and fillers.

The survey results show that 14,000 lbs/day of VOC from hand dishwashing detergents are released into the environment. However, not all of the emissions will enter the atmosphere. This is because hand dishwashing detergents are often diluted in water solutions and are disposed of down the drain. Studies conducted by the Soap and Detergent Association (SDA) show that up to 5 percent of the ethanol content in hand dishwashing detergents can be released to the air during use. Other SDA studies that modeled the "down the drain" fate of ethanol show that ethanol emissions from hand dishwashing detergents disposed of into the wastewater system can be less than 1 percent.

In estimating emissions, staff assumed that 5 percent of the VOC in hand dishwashing is emitted into the air. Therefore, of the 14,000 pounds per day total VOC emissions into the environment, 800 lbs/day are emitted into the atmosphere. Staff believe that this is a conservative estimate. If actual VOC emissions from the wastewater system are higher than the results from the SDA studies, overall emissions of hand dishwashing detergents may be higher. Staff will be working with staff from several regional water quality districts and the South Coast Air Quality Management District, which has adopted a rule requiring the quantification of VOC emissions from wastewater facilities, to confirm the relative emissions of "down the drain" VOC from dishwashing detergents.

#### **9. Household Adhesives**

Household adhesives have been defined in the proposed amendments to include products used to bond one surface to another by attachment. Excluded from the proposed amendments are products used on humans and animals, adhesive tape, contact paper, wallpaper, shelf liners, or any other product where the adhesive has been incorporated onto or in an inert substrate. In addition, products based on cyanoacrylate ester monomers are proposed to be exempt from the proposed standards.

Household adhesives are used to repair and maintain a wide variety of household items. These products are typically used to bind materials such as glass, plastic, rubber, wood, and metal together. Household adhesives are applied by brush, flow, wipe, and aerosol spray. These products contain various resins such as epoxies, silicones, and rubbers dissolved in both organic and inorganic solvent. The solvent is the media for transferring the adhesive materials to the substrate and also acts to promote adhesion by wetting the surface.

Household adhesives are available in aerosol, gel, liquid and other forms. Emissions from this category are estimated to be 2,400 lbs/day.

## 10. Insecticides

Insecticides are pesticide products intended for use against pests such as insects and other arthropods found in or around the household. All insecticides that are sold in California must be registered with the U.S. EPA according to the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), and the State Department of Pesticide Regulation (DPR).

Insecticides are divided into categories by primary uses or unique product form. Primary use categories are crawling bug insecticides, flying bug insecticides, flea and tick insecticides, wasp and hornet sprays, and lawn and garden insecticides. These primary use categories contain a multitude of products forms that include aerosols, pumps, liquids and solids. Insecticide fogger is a unique product form category that includes products designed for one or more of the above primary uses.

Insecticides rely on pesticide active ingredients that are toxic to the intended pest. These active ingredients' toxicity can act to poison and kill the pest or to regulate their growth. Active ingredients can work by contact or ingestion poisoning. Contact poisons can either act quickly to "knockdown" the pests, or act residually to kill pests that will contact the poison after application. New active ingredients such as late generation pyrethroids can provide both knockdown and residual properties. Active ingredients in consumer product insecticides are generally in very low concentrations of less than a few percent. The majority of the formulation contents are the inert ingredients, which function to propel, carry or deliver the active ingredient to the pests.

Aerosol products usually contain knockdown active ingredients to allow the user to quickly kill insects sprayed. Aerosols in the crawling bug, foggers, and flea and tick categories can also contain residual active ingredients. The inert ingredients in aerosol formulations include the propellant and the carrier systems. Hydrocarbon propellants are used in the large majority of the products. Hydrocarbon solvents, water based emulsions, and 1,1,1-trichloroethane (TCA) / hydrocarbon blends are used for carriers. In the category of flying bug insecticide, water-based emulsions are the prevalent system. However, in crawling bug insecticides, the dominant carrier system is hydrocarbon solvents. TCA / hydrocarbon blends are widely used for foggers and wasp and hornet insecticides. The aerosol products contribute the largest fraction of VOC emissions in all insecticide categories.

The majority of liquid and pump products are water-based emulsion products. Liquids are usually sold in concentrated emulsions, which require dilution prior to use. Pumps are usually sold in ready-to-use concentrations. Solid products can be divided into dusts, dissolvables, or baits. Dusts contain active ingredients mixed with

inert fillers or carriers. Baits contain active ingredients mixed in inert materials such as food or attractants.

The survey results show that the VOC emissions from insecticides are 18,500 lbs/day. In addition the category accounted for 6,800 lbs/day of emissions in 1,1,1-Trichloroethane.

## **11. Laundry Starch Products**

Laundry starch products are designed for application to fabric, either during or after laundering, to impart and prolong a crisp, fresh look and may also act to help ease ironing of the fabric.

Laundry starch products consist of starch, propellant (if aerosol), surfactant (wetting agent) and silicone (ironing aid). The principle function of starch in finishing textile fabrics is to impart or accentuate the desired physical characteristics in the cloth. In laundry work in homes or in commercial laundries, and in finishing clothing and other textiles, starch is used as a stiffening agent to form a smooth surface which does not become soiled readily making laundering easier. Starching washed clothes is a means of replacing the original finish of the cloth which was partly or completely removed by laundering. This finish, whether applied at the factory or in the home or laundry, leaves the textile material smoother, brighter, more pliable and holds down surface fibers; much starch, however, will stiffen the textile goods. Finally, laundry starch products can also extend the life of fabrics.

Laundry starch products are packaged in aerosol, pump, liquid and solid (dry) form. The total emissions from this category are 3,400 lbs/day.

## **12. Personal Fragrance Products**

The personal fragrance category consists of a wide variety of products designed primarily to add a scent to the human body or clothing and includes perfumes, colognes, toilet waters, body splashes and aftershaves. Products in the personal fragrance category typically contain fragrance oil in concentrations ranging from 1 percent to over 25 percent dissolved in ethanol and water. The concentration of fragrance oil generally dictates the amount of product used per application, with perfumes applied by the drop and body splashes and aftershaves splashed on by hand.

Personal fragrance products are available in many forms. Aftershaves and body splashes are generally liquid products, perfumes and toilet waters are primarily in liquid and pump spray form, and colognes are available in aerosol, pump spray, and liquid forms.

Emissions, almost exclusively ethanol, from the entire personal fragrance category total 10,900 lbs/day with about 8,000 lbs/day

contributed from the perfume/cologne/toilet water category, about 2,800 lbs/day from aftershaves and body splashes, and about 80 lbs/day from miscellaneous personal fragrance products.

### C. PROPOSED STANDARDS AND STANDARD EFFECTIVE DATES

The Phase II Consumer Products Regulation would establish VOC content standards for 12 different consumer product categories. The effective date of the proposed standards for the Phase II product categories is January 1, 1995, with the exception of three categories. The effective date is one year later for disinfectants and insecticides, which are products that must be registered according to FIFRA. To ensure consistency with the South Coast Air Quality Management District's (SCAQMD) Rule 1174, the standard effective date for charcoal lighter materials is January 1, 1992 in the SCAQMD and January 1, 1993 in all other areas of California. In addition, there are future effective standards for fabric protectants, crawling bug insecticides, dusting aids, aerosol household adhesives, and carburetor-choke cleaners.

The regulation prohibits the sale, supply, offer for sale, or manufacture for sale in California of any consumer product which at the time of sale contains volatile organic compounds in excess of the limits specified. Also, the standards are set on the basis of percent VOC by weight except for charcoal lighter materials which are set for pounds of VOC emissions per start. The percent by weight limits apply to products only after the "minimum recommended dilution" has taken place. Spot or incidental use of products with "minimum recommended dilution" in concentrated forms is allowed so products such as general purpose cleaners can be used occasionally in small amounts to treat hard-to-remove soils. Standards for hand dishwashing detergents apply only to the as-supplied product. This is because these products are all diluted for use, therefore it is not required to account for differences between dilutable and ready-to-use products. A summary of the proposed standards is shown in Table 5.



Table 5

Table of Standards  
(Phase II)

Percent Volatile Organic Compounds by Weight

<u>Product Category</u>	<u>1/1/95</u>	<u>Future Effective (Date)</u>
Aerosol Cooking Sprays	18	
Automotive Brake Cleaners	50	
Carburetor Choke Cleaners	75	50 (1/1/97)
Charcoal Lighter Materials *		
Disinfectants Aerosols	60	
Dusting Aids Aerosol	35	25
All Other Forms	7	(1/1/97)
Fabric Protectants	75	60 (1/1/97)
Hand Dishwashing Detergents	2	
Household Adhesives Aerosol	75	25
All Other Forms	10	(1/1/97)
Insecticides Crawling Bug	40	20 (1/1/98)
Flea and Tick	20	
Flying Bug	30	
Foggers	40	
Lawn and Garden	20	
Wasp and Hornet	40	
All Others	20	

Table 5  
(Cont)

Table of Standards  
(Phase II)

Percent Volatile Organic Compounds by Weight

<u>Product Category</u>	<u>1/1/95</u>	<u>Future Effective (Date)</u>
Laundry Starch Products	5	
Personal Fragrance Products		
Aftershave/Body Splashes	60	
Colognes, Toilet Water, Perfumes	70**	
All Other Personal Fragrance Products	50	

\* Effective January 1, 1993, no person shall sell, supply, or offer for sale, or manufacture for sale in California any charcoal lighter material without the written approval from the Executive Officer and without a demonstration to the satisfaction of the Executive Officer that the VOC emissions resulting from the ignition of charcoal with the charcoal lighter material are less than or equal to 0.02 pound of VOC per start.

\*\*The standard for colognes, toilet water and perfumes only applies to new products introduced after the effective date of the regulation.

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A one year period has been provided for retailers and suppliers to "sell through" products manufactured prior to the earliest effective date of the standard. In order to ensure that the sell through provision can be effectively enforced, the sell through period is not available for products that do not display the manufactured date of the product, or a code indicating such a date.

The effective date for products that are registered under FIFRA is one year after the date listed in the Table of Standards. FIFRA and State law requires that pesticide products be registered with the U.S. EPA and the California Department of Pesticides Regulation. The registration process requires companies to provide test results that demonstrate the safety and efficacy of new or reformulated products. This provision allows additional time for companies to register products reformulated for compliance. With this additional year for compliance, products subject to FIFRA requirements will have five years to come into compliance.

Effective January 1, 1993, any consumer product listed in the Table of Standards that is sold or manufactured in California cannot contain any ozone depleting compounds regulated by the EPA. This provision will not apply to any existing products sold and supplied prior to the effective date of the standards. The requirements of the regulation will also not apply to ozone depleting compounds appearing as impurities in amounts less or equal to 0.01 percent by weight.

## D. EMISSION REDUCTIONS

The emission reductions realized from the adoption of the proposed standards are 19,300 lb/d. A summary of the estimated emissions reductions for each new category is shown in Table 10. Emission reductions range from a low of 280 lb/d for automotive brake cleaners to 9,600 from insecticides.

Table 6  
Summary of Proposed Standards and Emission reductions

Product Category	VOC Emissions lbs/day	Proposed Standard Wt % VOC (1/1/95)	Emission Reductions lbs/day	Proposed Standard Wt % VOC (1/1/97)	Additional Emission Reductions lbs/day
Aerosol Cooking Sprays	1,480	18	400		
Automotive Brake Cleaners	1,600	50	280		
Charcoal Lighter Material* (Yearly Average)	9,600	0.02 lb/start	1,680		
Carburetor Choke Cleaners	3,300	75	560	50	740
Disinfectants - Aerosols	7,600	50	1,840		
Dusting Aids - Aerosol All Other Forms	980 20	35 7	180 20	25	220
Fabric Protectants	440	75	600	50	400
Hand Dishwashing Detergents	900	2	480		
Household Adhesives - Aerosol All Other Forms	940 1,520	75 10	50 900	25	400
Insecticides - Crawling Bug Flea and Tick Flying Insect Foggers Wasp & Hornet Lawn & Garden All Others	7,640 900 2,000 2,300 720 3,080 1,400	40 20 30 40 40 20 20	4,100 280 260 220 120 2,280 900	20 (1/1/98)	1540
Laundry Starch Products	3,400	5	480		
Personal Fragrance Products - Aftershave & Body Splashes Colognes, Toilet Water & Perfumes All Other	2,320 3,000 30	60 70 50	160 - 18		
<b>TOTAL</b>	<b>57,000</b>		<b>16,000</b>		<b>1,100</b>

\*Includes emissions only from petroleum distillate-based fluids.

Notes: Totals have been rounded to the nearest 100 pounds.

Total Reductions (1995 & 1997) 16,000 + 3,300 = 19,300 lbs/day

When the emissions reductions from Phase II are combined with the emissions reductions from the previously adopted consumer product regulations the combined total is estimated at 118,300 lbs/day or 60 T/D. This represents approximately a 30 percent reduction in consumer product emissions.

Table 7

Total VOC Emissions Reduction from All Consumer Product Regulations

<u>Year</u>	<u>Emission Reduction</u> <u>lbs/day</u>
1993	53,000
1994	12,000
1995	16,000
1996	9,000
1997	3,300
1998	<u>25,000</u>

Total: 118,300 lbs/day  
(60 T/D)

## E. METHODS OF COMPLYING WITH THE STANDARDS

Several methods are available to reformulate products that do not currently comply with the standards in the proposed regulation. The VOC solvents may be replaced in part or in whole with water or another non-VOC material. The percentage of active ingredients, which in many cases are low vapor pressure materials exempt from the VOC standards, may be increased. The VOC propellants may be replaced with a non-VOC alternative. The product form may be changed. Finally, the innovative product provision may be an option for products that do not meet the VOC standards, but result in lower emissions than would be achieved through compliance with the standard, due to some feature of the product.

One method of complying with the proposed VOC standards is to replace the VOC solvents with water. This may be achieved by the creation of an emulsion system or by changing to water compatible active ingredients. In an emulsion system, two separate liquid phases are present with one phase dispersed in small droplets throughout the other "continuous phase". In many consumer products, a water and solvent/oil phase are present, with the active ingredients dissolved in the solvent/oil phase. Often, emulsifying agents, such as surfactants, are added to the formulation to facilitate the mixing of the two phases. As an example, aerosol air fresheners may be classified as single phase or dual phase systems. The single phase air fresheners are solvent based while the dual phase air fresheners are typically emulsion systems with a water phase and a solvent phase which contains the fragrance. The 1990 and 1991 consumer product surveys revealed that the solvent based, nonemulsion, aerosol air fresheners are nearly 100 percent VOC, while the dual phase emulsion systems are typically in the range of 30-35 percent VOC, since water makes up one phase. Water emulsion complying products have been identified in many categories including dusting sprays, insecticides, aerosol cooking sprays, carburetor and choke cleaners, brake cleaners, and personal fragrance products. Manufacturers with noncomplying products can very likely utilize emulsion technology to comply with the regulation.

Another way to allow the replacement of VOC solvent with water is to use water compatible active ingredients. Some manufacturers may utilize existing water compatible actives to develop complying products. For instance, insecticide products with active ingredients sensitive to water may be reformulated with certain pyrethroids which are stable in water in emulsion systems. Other manufacturers may have to develop water compatible active ingredients. As an example, Kodak is in the process of developing a hairspray resin that is soluble in demineralized water, in contrast to current products which are soluble in ethanol (Eastman Kodak).

For products with active ingredients that are non-VOC or low vapor pressure exempt compounds, compliance may be achieved by increasing the concentration of these "actives". As an example, an adhesive may increase the content of nonvolatile polymers that form the bond after the solvents have evaporated.

Aerosol products with hydrocarbon (VOC) propellants may be able to reduce their VOC content by replacing the hydrocarbon propellant with a non-VOC alternative. For instance, if a product utilizes a propellant only to dispense the product ingredients, and not for its solvent properties, compressed gas propellants may be an alternative. Aerosol valve technology utilizing special nozzles or "micro-tap" technology to maintain consistent spray characteristics is currently available for products using compressed gases or compressed gas/hydrocarbon propellant blends (Aerosol Age, Dec. 1989 and Dec. 1990) (Summit Valve). In addition, research and development efforts are currently underway to expand the application of this technology (Summit Valve). Another option that has recently been utilized in a hairspray product is the "Airspray" system which is manually pumped by the operator. Yet another unique option is the "Exxel" system which uses a rubber bladder to force out the product ingredients.

If the propellant must also function as a solvent, hydrofluorocarbon (HFC) propellants may be an alternative to hydrocarbon propellants. HFC-152a is one possible alternative to hydrocarbon propellants. HFC-152a has a moderately high vapor pressure of 62 psig at 70 F and is a fair solvent with a Kauri-Butanol (KB) value of 11. The KB value is a measure of a solvent's strength, with higher KB values representing "stronger" solvents. HFC-152a is relatively expensive at about \$1.75/lb, compared with less than \$0.30/lb for hydrocarbon propellants (DuPont). HFC-152a is currently used alone or blended with hydrocarbon propellants in hair mousse products and is described as easy to work with from a formulation point of view (Johnsen). While production of HFC-152a is currently limited, capacity and consumption are increasing (DuPont). It is expected that the cost of HFC152a will be reduced as production increases due to the marketplace economics.

Although in general the proposed regulation is not designed to require a product to change forms in order to meet the VOC limits, this option is available to manufacturers. Since most of the product standards include different VOC limits for different product forms, changing the form of the product may provide a more favorable means of approaching the VOC limits for an individual product.

Finally, the innovative product provision is available to products that do not meet the VOC standards, yet result in less emissions due to some feature of the product. Potential candidates for this provision include: (1) products that deliver the active ingredients more efficiently, allowing less product to be used; (2) products that contain more active ingredients or more effective active ingredients; and (3) products that emit VOC ingredients that are transformed to non-VOCs.

#### F. ADDITIONAL AMENDMENTS

The proposed amendments include 72 new or revised definitions and the deletion of 14 definitions. Forty-three new definitions are being proposed to be added to Section 94508. These new definitions are listed in Table 8. Of these, 17 are definitions for the new product categories being

proposed for amendment and 26 are definitions added to clarify terminology referenced in the regulation.

Table 8

Definitions Proposed for Addition

Aerosol Cooking Spray	Aftershave
Agricultural Use	All Other Carbon-Containing Compounds
All Other Forms	Automotive Brake Cleaner
ASTM	California Sales
Body Splash	Cologne
Charcoal Lighter Material	Container/Packaging
Consumer	Device
Crawling Bug Insecticide	Flea and Tick Insecticide
Existing Product	Hand Dishwashing Detergent
Flying Bug Insecticide	Insecticide
Household Product	Label
Insecticide Foggers	LVP Compound
Lawn and Garden Insecticide	Perfume
Non-Carbon Containing Compound	Personal Fragrance Product
Person	Product Brand Name
Principal Display Panel(s)	Product Form
Product Category	Restricted Use Pesticide
Responsible Party	Table B Compound
Spray Buff Product	Type A Propellant
Toilet Water	Type C Propellant
Type B Propellant	Wasp and Hornet Insecticide
Usage Instructions	

Table 9 identifies the categories which were revised in the regulation.

Table 9

Definitions Proposed for Modification

Aerosol Product	Air Freshener
Automotive Windshield Washer Fluid	Bathroom and Tile Cleaner
Carburetor - Choke Cleaner	Disinfectant
Distributor	Dusting Aid
Fabric Protectant	Floor Polish or Wax
Furniture Maintenance Product	General Purpose Cleaner
Household Adhesive and Sealant	Insect Repellent
Institutional Product or "Industrial and Institutional (I&I) Product"	Laundry Starch Product
Nonresilient Flooring	Liquid
Pesticide	Manufacturer
Pump Spray	Paint
Retail Outlet	Propellant
Volatile Organic Compound	Retailer
Wood Floor Wax	Solid
	Wax

Table 10 identifies those categories that have been deleted. The categories were deleted because the category was no longer applicable to the regulation, was combined with another category, or has been postponed for consideration.

Table 10

Definitions Proposed for Deletion

Aerosol Food Product	Automotive Bug and Tar Remover
Automotive Chrome Polish	Automotive Tire Dressing
Automotive Leather/Vinyl Cleaner	Automotive Wheel Cleaner
Brake Cleaner	Cleaner
Food	Household Consumer
Household Pesticide	Industrial Spray Buff
Lubricant	Rug Deodorizer
Water Proofing Products	

2. Exemptions

Staff proposes to amend section 94515 - "Exemptions" by modifying the exemption for fragrance and to add an exemption that would apply to cologne, perfume, and toilet water.

Fragrance: The VOC standards, as adopted in 1990, do not apply to fragrances and colorants up to a combined level of 2 percent by weight contained in any consumer product. This exemption was established to allow manufacturers a de minimus level of these substances in various products such that the products may be marketed in an appealing manner to consumers. Staff proposes that this exemption for fragrances and colorants be modified by deleting colorants from the exemption and amending the exempted level to 1 percent.

The staff determined that a 2 percent exemption for fragrances may not be appropriate. Based on telecommunications with colorant manufacturers (BASF, Seltzer), it was revealed that colorants are solid compounds with low vapor pressures and are, therefore, already exempt from the standards in the regulation under section 94510(c). Further review of formulations found in industry trade journals and a report prepared for the New York State Department of Environmental Conservation demonstrated that most consumer products contain less than 1 percent fragrance. (Household & Personal Products Industry) (Pacific Environmental Services) In addition to the referenced sources above, staff also received information (Fragrance Materials Association) which indicates that the level of fragrance used in hair sprays, shaving cream, general purpose cleaners, laundry detergents, and spray furniture polish is less than 1 percent.

For products with a fragrance content greater than 1 percent, such as some air fresheners and personal fragrance products, the fragrance content



can be considered an active ingredient of the product and is often present in the formulation at higher percentages, approximately 1 to 25 percent for personal fragrances, and 1 to 6 percent for air fresheners. Since for these products the fragrance is a significant part of the total VOC, the fragrance VOCs were taken into consideration in determining the proposed standards.

Cologne, Perfume, and Toilet Water: Proposed section 94510(h) would provide an exemption from the VOC standards for colognes, perfumes, or toilet water formulations registered within 90 days of the effective date of the consumer products regulation as required under section 94513(a). This would exclude existing perfume, cologne, and toilet water formulations from the 70 percent VOC standard specified in section 94509(a). While the technology exists to produce these products at 70 percent VOC as evidenced by the 84 complying products currently available, staff recognizes the difficulties that would be encountered in reformulating existing products to the proposed 70 percent standard while retaining the identical scent. New products, in contrast, should be able to be developed within the constraints of the proposed 70 percent standard. This is further discussed in Chapter VII, "Product Category Issues." While staff recognizes the difficulties in reformulating existing products, staff intends to continue evaluating technologies available to the perfume industry and will reevaluate the need for this provision in the future.

Paradichlorobenzene: The exemption for paradichlorobenzene (PDCB) has been extended for moth-proofing products comprised of at least 98 percent PDCB. At this time, staff is unaware of suitable replacements for these products (mothballs). Staff will continue to evaluate the appropriateness of the exemptions for PDCB and will recommend amendments if further studies demonstrate that the exemptions are unnecessary.

### 3. Innovative Products

The primary change proposed for the innovative product provision is to clarify the procedure by which emissions from an innovative product are compared to the emissions from a noncomplying product "had it been reformulated" to comply. The present provision allows a manufacturer to demonstrate that a product is innovative in one of two ways. A product can be "innovative" by (1) demonstrating that its VOC emissions are less than the emissions from a complying representative product or, (2) "if the innovative product is a modification to an existing product", by showing that the use of the product will result in less VOC emissions as compared to the reductions in emissions that would have occurred from the existing product had it been reformulated to meet the standards.

The problem with the existing version is that the language "if the innovative product is a modification to an existing product" limits the innovative product to modifications of existing products, if it chooses to compare its emissions to a noncomplying product. This limitation is unnecessary and confusing, since it is difficult to distinguish between a modification to an existing product and a completely new product. Language has been proposed removing this restriction and clarifying how the emissions from a "noncomplying product had it been reformulated" are to be determined.

Other proposed changes to the Innovative Products Provision include correcting inconsistent usage of the terms "emissions" and "emission reductions", and adding language to section (f), now proposed section (e), which allows the Executive Officer to specify terms and conditions necessary to verify that the requirements of the provision are met.

#### 4. Test Methods

Section 94515 is proposed for amendment to incorporate new test methods for solids and charcoal lighter fluid. The proposed test methods are ASTM D-4359-90 Determination Whether a Material Is a Liquid or a Solid and South Coast Air Quality Management District Rule 1174 Ignition Method Compliance Certification Protocol, dated February 28, 1991.

The record keeping provision in this section is also proposed for amendment to require that manufacturers maintain records for only those days in which production occurred. Under existing language, manufacturers are required to keep records even for days on which they did not produce any products. This amendment is designed to reduce the amount of records required by a manufacturer and to simplify the reporting process.

#### References:

Aerosol Age, "Micro-vapor tap improves CO2 Performance," Aerosol Age, December, 1989.

Aerosol Age, "Actuator button regulates container pressure," Aerosol Age, December 1990.

1991 ARB Consumer Products VOC Survey, sent to consumer product manufacturers on March 12, 1991.

BASF, telephone conversation between BASE representative and Tom Evanshek, September 3, 1991.

DuPont, telephone conversation with Paul Milkey, circa 10/1/91.

Eastman Kodak Co., "Eastman AQ Polymers For Water-Based Hair Spray," Publication No. CB-14A, December, 1990.

FIFRA, Federal Insecticide, Fungicide and Rodenticide Act. As Amended, 7 U.S.C., 136-136y.

Fragrance Materials Association of the United States, personal communication to Paul Milkey, July 10, 1990.

Haimov, Mitch, et al., SCAQMD Source Testing and Monitoring Branch, "Emissions of Volatile Organic Compounds from Various Charcoal Ignition Methods", September 1990.

Household & Personal Products Industry, Formulary, Volume 3, 1988.

References (cont):

Johnson, Montfort. A.. "The Fluorocarbons--Old Problems and New Opportunities," Aerosol Age, January, 1991.

Kennedy, Tim, Clorox Company, Presentation to ARB staff, March 19, 1991.

Lieu, Sue, SCAQMD Planning Division, "Addendum to Staff Report: Socioeconomic Impact Assessment, Proposed Rule 1174, Control of Volatile Organic Compound Emissions from the Ignition of Barbecue Charcoal", September 1990.

Marinoff, Steven, South Coast AQMD Source Testing and Monitoring Branch, Personal communication with Floyd Vergara, October 2, 1991.

Nielsen Marketing Research sales data for California, submitted by Tim Kennedy to ARB on March 19, 1991.

Pacific Environmental Services, "Analysis of Regulatory Alternatives For Controlling Volatile Organic Compound (VOC) Emissions From Consumer and Commercial Products in the New York City Metropolitan Area", January 17, 1990, Appendix E.

Perryman, Pamela, SCAQMD Office of Planning and Rules, "Staff Report: Proposed Rule 1174, Control of Volatile Organic Compound Emissions from the Ignition of Barbecue Charcoal", September 1990.

Seltzer, telephone conversation between Seltzer representative and Tom Evashenk, September 3, 1991.

Summit Packaging Systems, Inc., telephone conversation with Paul Milkey, 10/1/91.

#### IV.

### IMPACTS ASSESSMENT

#### A. ENVIRONMENTAL IMPACTS

The staff's proposal will limit the volatile organic compound content for 12 new product categories. The primary environmental impact will be a decrease in VOC emissions to the environment. Because VOCs are involved in the formation of tropospheric ozone, a reduction in VOC emissions is expected to result in a positive impact on air quality and public health.

During the development of the proposed amendments, staff considered the potential impact of the proposed amendments on the environment. Specifically, staff considered the potential impacts on stratospheric ozone depletion, greenhouse warming, water pollution, landfill space, and toxic air contaminants from implementation of the proposed amendments. As more fully explained in the Technical Support Document, staff expect no significant environmental impact from adoption of the proposed amendments. In addition, no adverse environmental impacts from implementation of the proposed amendments have been identified with respect to earth, plant, animal, noise level, and the use of land and natural resources.

The proposed amendments are expected to result in an overall reduction in VOC emissions and a decrease in both ambient ozone and PM10 concentrations. Due to the nature of consumer products, the emission reductions would be directly proportional to the population of each area in the state.

#### B. ECONOMIC IMPACTS

The proposed regulation will require the reformulation of some products in each category. However, for all the new product categories listed, there are products on the market which can meet the standards proposed for January 1, 1995. Staff performed an economic analysis to determine the cost-effectiveness of the proposed amendments. Two separate analyses were performed; one which assumed reformulated products will retain the same product form; and one which assumed reformulation to a different product

form. For both analyses, staff assumed that new products would be marketed nationally. Based on information from industry, the majority of consumer product manufacturers market products nationally. Most of these companies plan to market products reformulated for California nationally whenever possible.

For the first analysis, staff assumed that product reformulation would not require any major retooling or equipment changes since product forms would stay the same. In addition, staff assumed that there would be no per unit material cost increase and that marketing costs would be minimal. For the second approach, staff assumed that the change in product form would require a change in the delivery system. This would require changes to production equipment and/or delivery system of the product. Staff assumed this would create additional costs due to personnel resources, packaging, distribution, and warehousing. Staff also assumed that the new product form would require additional marketing costs, research studies and tests, promotional literature, and consumer tests.

Based on the assumptions discussed above, the staff estimate that the cost to reformulate a non-complying product to meet the proposed regulations will range from \$76,000 to \$1,100,000. Annual cost estimates for reformulating a single product range from \$15,600 to \$270,000. The total annual cost to industry is estimated to be between 13 and 205 million dollars.

The results of these analyses were a cost-effectiveness range from less than \$.01 per pound of VOC reduced for the low cost analysis to \$1.04 per pound of VOC reduced for the high cost analysis. The range in the cost-effectiveness estimates reflects the uncertainty in the cost to reformulate the wide variety of products covered under the regulation. Table 11 shows a comparison of the cost-effectiveness of the proposed amendments to other measures that have been adopted in recent years. As shown in Table 11, the cost effectiveness of the proposed regulation is within the range of other control measures adopted by the Board.

Table 11

**Comparison of Cost-Effectiveness of the Proposed Amendments to  
the Consumer Products Regulation with Cost-Effectiveness  
of Other Control Measures for Criteria Pollutants**

<u>Source</u>	<u>Pollutants(s)</u>	<u>Cost Effectiveness (\$/Ton of Pollutant Reduction)</u>
Architectural Coatings (1989)	VOC	Net savings-12,800
Low Emission Vehicles/Clean Fuels (1990)	NOx, VOC, CO	10,000-32,000
Light Duty Diesel Exhaust Standards (1987)	PM10	5,400-21,400
Heavy Duty Diesel Exhaust Standards (1985)	PM10	6,400
Deodorants & Anti-perspirants (1989)	VOC	1,000-2,400
Phase I Consumer Products (1990)	VOC	Net Savings-2,100
Phase II Consumer Products (1991)	VOC	8-2,100

The economic impact of the proposed amendments on consumers is difficult to assess as it would depend on many factors including consumer preference, loyalty to a product, and the price of a product. Staff expects that the cost of reformulation will be passed from the manufacturer to the consumer.

### C. SMALL BUSINESS IMPACTS

Staff evaluated the impact of the proposed amendments on small businesses to determine if small businesses would experience significant adverse economic impacts. Based on a comparison of the return on owner's equity (ROE) before and after costs associated with the proposed amendments, staff concluded that small businesses engaged in retailing and wholesaling of consumer products and most small manufacturers would probably not be adversely affected by the regulation.

V.

PHASE I - FOLLOW UP ISSUES

During the process of developing the consumer product regulation and the current proposed amendments, ARB staff believe it has been responsive to legitimate concerns raised by industry representatives. As a result, staff's proposals have experienced numerous modifications and revisions during the regulatory process. There are some issues, however, that likely will remain and which are discussed in the next three chapters. In this chapter, the staff discusses issues that were raised during Phase I and/or that the Board requested additional investigation.

**A. SELL-THROUGH PERIOD FOR NON-COMPLYING PRODUCTS**

This section addresses whether a one-year sell-through period for non-complying products is sufficient for the consumer products subject to this regulation and whether special or additional sell-through provisions are needed for small businesses.

At the October 1990 Board hearing, industry representatives testified that a one-year sell-through period is not sufficient. The industry representatives requested using the date the product was manufactured to determine compliance. They also requested, that if the date of manufacture could not be used to determine compliance, a three year sell-through period be allowed to avoid an unnecessary recall of products.

In response to the information presented by the staff and to the industry's testimony, the Board adopted the one-year sell-through period. However, the Board requested the staff to investigate further whether special or additional provisions are necessary for small retail businesses and to report back to the Board when amendments to the regulation are submitted for the Board's consideration in 1991.

In response to industry's concerns and to the Board's directive, the staff conducted further research to determine if the one-year sell-through period is sufficient for small businesses and businesses in general. The research included a re-evaluation and update of information gathered in 1990 and new data obtained from a retail business survey conducted by ARB staff

in 1991. Based on this information, the staff believes a one-year sell-through period is sufficient for all businesses, large and small. A brief discussion of the information obtained by the staff to support the one-year sell-through period is given below. A more detailed summary can be found in the Technical Support Document.

## 1. Consumer Product Retail Store Survey:

To implement the Board's directive regarding whether consideration of special or additional provisions are necessary for small retail businesses, ARB staff conducted a survey of selected retail businesses in California.

Staff relied upon the definition for small business that is used by the United States Small Business Administration (SBA) to provide the general parameters for the consumer product retail store survey. According to SBA, a "small" business is defined as one that is independently owned and operated, not dominant in its field and meets employment or sales standards developed by the agency. (13 Code of Federal Regulations, section 121, Small Business Size Regulations (1976) For the retail trade industry, the sales standard is given as the average annual sales that do not exceed \$ 3.5 million dollars for the preceding three fiscal years (up to \$ 13.5 million dollars under some circumstances).

The survey was designed to obtain representative data from retail businesses. Using information from both the SBA and the County Business Patterns 1988 (U.S. Department of Commerce, 1990), staff developed a number of questions that related to employees, annual gross sales, ownership and sell-through period for products representative of those being regulated. Although the SBA has established definitions on what is considered a "small" business, staff developed the questions such that a further breakdown and perhaps a more representative assessment of the type of "small" businesses that sell representative products can be obtained.

The survey form was sent to 4,000 retail businesses in California that would most likely sell products subject to the regulation, including hardware stores; retail nurseries; lawn and garden supply stores; variety stores; general merchandise stores; grocery stores; auto and home supply stores; drug stores and liquor stores.

## 2. Survey Results and Discussion

Of the 4,000 surveys mailed to retail businesses, 531 were completed and returned to the ARB. Of the survey respondents, 475 had sales less than \$3.5 million per year. For the product categories surveyed, (automotive, personal care, pesticides, household, and miscellaneous), approximately 89 percent responded that the products were sold in less than 1 year. As shown in Figure 3, this data indicates that for all categories, a proportionally higher number (89 percent) of the products were sold within 1 year.

Although there was good correlation between the annual sales and sell-through, no such correlation between annual sales and number of employees

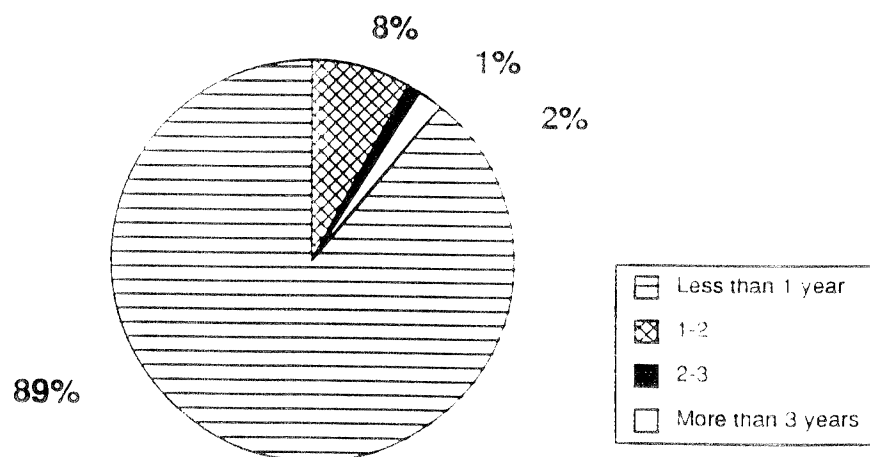


could be derived from the survey. This is not entirely unexpected, since there are numerous businesses which although they have relatively few employees, nevertheless sell a significant amount of merchandise. Thus, for the purposes of this discussion, staff will use the term "small business" in relation to annual sales rather than the number of employees.

According to the SBA definition, "small" retail businesses do not have more than \$3.5 million dollars in annual sales. To be conservative and to determine if a smaller annual sales definition is more appropriate for this analysis, staff looked at the sell-through period for businesses with less than \$0.5 million dollars in annual sales. For these businesses, which include stores commonly referred to as "mom and pop" stores, staff also found that a proportionally higher number of products were sold within 1 year. As shown in Figure 4, 87 percent of the products in businesses with less than \$0.5 million dollars in annual sales were sold within 1 year, 10 percent were sold within 2 years, 1 percent were sold within 3 years, and 2 percent were sold after 3 years.

Based on the results from the retail survey and on our understanding of the relationship covering the distribution of consumer products, staff conclude that the one year sell-through is sufficient to allow for the removal of noncomplying products from retail store shelves, including those products in small businesses and so-called "mom and pop" stores.

**Typical Sell-Through Period  
for Stores Having Sales Less Than \$3,500,000  
Air Resources Board  
Retail Store Survey**



**Figure 3**

**Typical Sell-Through Period  
for Stores Having Sales Less Than \$500,000  
Air Resources Board  
Retail Store Survey**

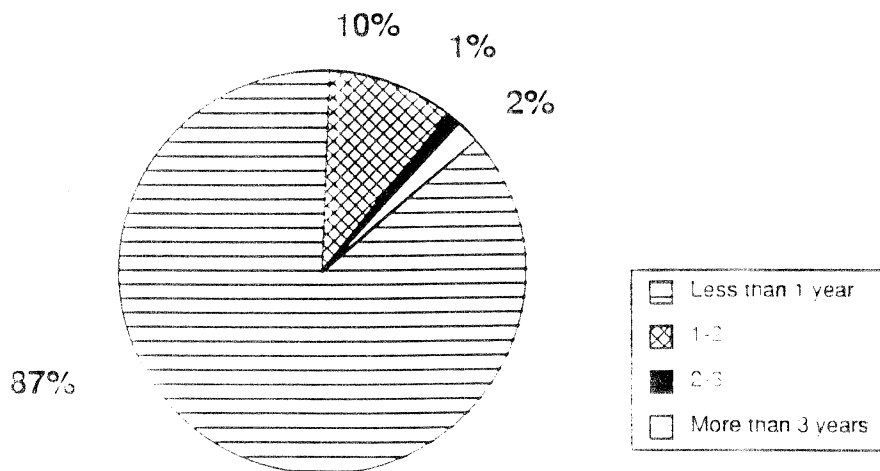


Figure 4

#### B. GLASS CLEANERS

Industry has requested that the subcategory "All Other Forms" of glass cleaner should be relabeled as "Liquid/Pump Sprays" in order to clarify that the standards are applicable only to liquid and pump sprays, and that cloth wipes are not subject to any regulatory standard whatsoever.

The staff believes this change is unnecessary for the following reasons. First, cloth wipe glass cleaners are merely liquid glass cleaners impregnated into a cloth package. As such, the ARB has no information to indicate that cloth wipe cleaners cannot meet this regulatory standard. Secondly, even if cloth wipes cannot meet the standard, the regulation is still technologically and commercially feasible since over 80 percent of currently marketed glass cleaners already comply with the proposed standards.

Finally, a few commenters have expressed the view that in approving the Phase I regulation, the Board had intended to regulate only liquid and pump glass cleaner sprays. However, the rule making record demonstrates that the Board did not intend to so limit the scope of the regulatory standard. To clarify the Board's intent for both glass cleaners and other consumer product categories for which this term is used, the staff is proposing a definition for "all other forms" which clarifies that wicks, powders, cloth or paper wipes, etc. are subject to the regulatory standards.

### C. BATHROOM AND TILE CLEANERS

Industry representatives commented at the October 11, 1990 hearing that the 5 percent standard for aerosol bathroom and tile cleaners was not technologically feasible. In its resolution adopting the consumer products regulation last year, the Board directed the Executive Officer to gather additional data on the feasibility of a 5 percent VOC standard for bathroom and tile cleaners.

The 5 percent standard for bathroom and tile cleaners, including aerosol bathroom and tile cleaners, was set, in part, based on data from the 1990 Consumer Products Survey as supplied by Heiden and Associates. The initial data supplied by Heiden showed that 5 aerosol bathroom and tile cleaners complied with the 5 percent standard. Heiden and Associates subsequently supplied the ARB with corrected data which listed one aerosol bathroom and tile cleaner at or below the 5 percent standard. Data from the most recent consumer products survey conducted by ARB lists no aerosol bathroom and tile cleaners that comply with the 5 percent standard.

In response to the most recent survey data and further consultation with manufacturers of bathroom and tile cleaners, staff are proposing a 7 percent standard for aerosol bathroom and tile cleaners.

### D. LAUNDRY PRE-WASH PRODUCTS

At the October 11, 1990 Hearing, the Board directed staff to examine the feasibility of a 5 percent VOC standard for laundry prewash products in forms other than aerosols or solids. Staff reviewed current data on this category and have determined that the limit is feasible.

The majority of the emissions from laundry prewash is contributed from the aerosol forms. From the 1990 survey results, staff estimated that emissions from aerosols accounted for 80 percent of total category emissions. The survey also showed that the VOC contents of aerosols and solids are considerably higher than other forms. Based on similar findings from the previous survey, staff proposed two standards for the category. The standard at 22 percent for aerosols and solids reflected low VOC technology in those two product forms and should achieve emission reductions from both forms. The standard at 5 percent for all other forms was proposed to "cap" VOC contents for products such as liquids and pumps that are already at low VOC levels. The "cap's" primary purpose is to prevent future emission increase. Since the "all other" forms represent 80 percent of the California sales, the increase of product VOC content up to a 22 percent level from the current levels could represent a maximum of 10,000 lbs/day of additional emissions.

VOC emissions for aerosol products approximate the VOC content because propellants and other light hydrocarbon solvents readily volatilize. The Reckitt and Colman company commented last year that the emissions of VOCs from liquid products may not be significant. They cited results from a study they conducted that showed that fabrics treated with liquid prewash

did not have a significant weight loss after 3 minutes of exposure to air. The staff believes that the observation of no weight loss in the fabric does not prove insignificant emissions. The simplistic gravimetric method used in the study did not account for any possible weight gain of the fabric by other means that would offset weight loss from VOC emissions. For example, if VOC emissions from the application to the fabric and moisture adsorption onto the fabric occur simultaneously, the weight from the adsorbed water, which has a higher density than most VOCs, could offset the weight loss from VOC emissions. The staff believes that gravimetric methods must also include speciation analysis to accomplish a per compound "mass balance" to interpret the basis for the weight changes or the lack thereof.

Although the relative emissions from liquid laundry prewash is still in question, staff believe this does not conflict with the regulatory intent of the standard for "all other" forms. The staff did not project any emission reductions from the standard for "all others", which includes liquid laundry prewash. The standard was set to prevent the shifting of emissions from aerosol and solid forms into the "all others" forms. An example of this is that the standard will not allow increased use of VOC in liquid and pump products that may be much more volatile than the glycol ether that is in the prewash products used in the Reckitt Colman experiment.

The staff believe that the 5 percent standard for "all other" forms of laundry prewash should be retained, and that it is commercially and technologically feasible. The 1990 survey results show that over 94 percent of the market already complies with this standard. The complying products span the household as well as the institutional and industrial markets.

#### E. CHARCOAL LIGHTER MATERIALS

In ARB Resolution 90-60 (dated October 11, 1990), the Board directed the Executive Officer to analyze the VOC emissions from charcoal lighter fluids as follows:

"BE IT FURTHER RESOLVED that the Board directs the Executive Officer to survey the amount of VOC emissions from charcoal lighter fluid in the state, and to report to the Board in 1991 on whether it may be appropriate to adopt a regulatory standard for charcoal lighter fluid."

ARB staff has complied with the Board's request and has surveyed the VOC emissions from charcoal lighter fluids and evaluated the feasibility of reducing these emissions. As discussed in more detail in the Technical Support Document, staff have drawn the following conclusions from this analysis:

1. A year-round average (uncorrected for seasonal variation) of approximately 28,000 lbs/day of charcoal lighter fluid is used in California (1991 ARB VOC Survey; Nielsen). Because the product is incompletely combusted or otherwise evaporates to a certain degree prior to combustion, approximately 20 percent of the product used, or about 5,600 lbs/day, is actually emitted into the atmosphere statewide (Marinoff; Kennedy).

2. Assuming that the majority of charcoal barbecuing occurs between May and October, ARB staff estimate that peak summer VOC emissions for this category are about 11,200 lbs/day statewide (Perryman). Unlike other product categories, barbecuing is expected to be a seasonal activity. Thus, the peak summer emission estimate may be a more accurate estimate of VOC emissions which would impact attainment with applicable air quality standards more than a yearly average emission estimate.
3. Staff estimate that the emissions from this category will be reduced by approximately 30 percent, resulting in 1,700 lbs/day reductions (yearly average) and 3,200 lbs/day reductions (peak summer average).
4. Clorox Company representatives have submitted data which indicate that changing the formulation (i.e., various petroleum fractions) to minimize emissions can be accomplished (Kennedy). This was supported earlier this year with the announcement that a successful reformulation of the Kingsford Lighter Fluid passed the SCAQMD Rule 1174 limit of 0.02 pound VOC per start.
5. The SCAQMD has conducted the major laboratory testing and regulatory development for this product category in developing their Rule 1174. To maintain statewide consistency, ARB staff's proposed standard and regulatory requirements for charcoal lighter fluids are designed to be equivalent with their counterparts in SCAQMD Rule 1174.

Because charcoal lighter fluids complying with the SCAQMD's Rule 1174 are now available, staff is proposing charcoal lighter fluid limits consistent with SCAQMD Rule 1174.

#### References:

1991 ARB Consumer Products VOC Survey, sent to consumer product manufacturers on March 12, 1991.

Nielsen Marketing Research sales data for California, submitted by Tim Kennedy to ARB on March 19, 1991.

Marinoff, Steven, South Coast AQMD Source Testing and Monitoring Branch, Personal communication with Floyd Vergara, October 2, 1991.

Kennedy, Tim, Clorox Company, Presentation to ARB staff, March 19, 1991.

Perryman, Pamela, SCAQMD Office of Planning and Rules, "Staff Report: Proposed Rule 1174, Control of Volatile Organic Compound Emissions from the Ignition of Barbecue Charcoal", September 1990.

## VI.

### GENERAL ISSUES

#### A. ENVIRONMENTAL PATHS OF VOC EMISSIONS TO THE ATMOSPHERE

Many consumer products are used indoors and questions have been raised regarding whether or not these emissions reach the outdoor or ambient air. While it is widely recognized that ventilation of indoor areas and the normal infiltration of air into indoor areas, result in indoor emissions reaching the ambient air the staff reviewed the current literature to further investigate regarding this premise. Based on the information available, the staff has concluded that, with time, VOCs that are emitted to the indoor air, will migrate to the outdoor air and be available to participate in the photochemical reactions that result in ozone. A brief discussion of this subject is presented below.

##### 1. Indoor vs. Outdoor Emissions:

VOC emissions from consumer products must reach the ambient air before they are available for participation in the reactions that lead to ozone formation. The VOCs in consumer products may reach the ambient air by a number of routes, depending on a variety of factors such as the chemical composition of the product, product usage, the location of usage, and the ambient conditions (e.g. temperature, air flow, humidity).

When consumer products such as charcoal lighter fluids, insect repellants, and automotive products are used outdoors or in well ventilated areas such as a garage or bathroom with an exhaust fan, VOCs are provided a direct route to the ambient air after they have vaporized. There are some opportunities in these cases for interaction with surfaces ("sinks"), which will be described in more detail below. However, in general, these effects are less pronounced than in enclosed indoor environments where vapors have a less direct path to the ambient air.

Indoor emissions of VOCs from consumer products escape to the atmosphere through the infiltration/diffusion of indoor air with outdoor air in what will be referred to as air exchange. Prior to transport to the ambient air, however, there may be other processes that can occur. These

can be simplified into the four processes described under "Indoor Emissions".

## 2. Indoor Emissions:

Indoor emissions of VOCs from consumer products can reach the atmosphere by a variety of mechanisms. The following cases represent the primary routes to the atmosphere: (a) gaseous or vapor phase compounds reach the ambient air with air exchange; (b) liquid VOCs evaporate over time and exit with air exchange; and (c) gaseous VOCs are adsorbed on surfaces and subsequently desorbed and reach the ambient air through air exchange. These cases are not meant to be mutually exclusive. For instance, an aerosol propellant, which is a gas at room temperature, may directly enter the ambient air with air exchange and partially adsorb onto a surface then subsequently desorb for transport to the ambient air.

### (a) Vapor Phase Organics are Transported with Air Exchange:

The propellants used in aerosol products such as isobutane, propane, dimethyl ether, and partially halogenated chlorofluorocarbons such as HCFC-142b, HCFC-22, and HFC-152a are gases at room temperature. These gases are emitted when an aerosol product is sprayed and are immediately available for removal as a building's indoor air is exchanged with outdoor air. Highly volatile liquids and products delivered in a fine mist may also be immediately available for transport to the ambient air through air exchange. In these cases, transport to the outdoor air will be a function of the exchange rate.

The air exchange rate, commonly expressed in air changes per hour (ACH), is a measure of the rate at which indoor and outdoor air are exchanged and will be a function of the heating and ventilation system in the house or building, as well as openings such as windows and doors. Most houses in California would be expected to have infiltration rates between about 0.5 and 1.5 ACH, although in houses which have been sealed tightly to conserve energy, the rate may be as low as 0.2 ACH (NCR). VOC emissions will be transported to the ambient air more quickly with high infiltration rates.

### (b) Liquid VOCs Evaporate Over Time and Exit with Air Exchange:

Liquid VOCs such as the solvents in consumer products must evaporate before they can be transported to the ambient air by air exchange. Liquids will continue to evaporate until an equilibrium is reached between the liquid and vapor phases. Since, the amounts of liquid will be small compared to the volume of virtually any indoor area and since vapor is continually removed due to air exchange, the liquid will continue to evaporate until it is gone. The rate of evaporation will be a function of many factors such as the vapor pressure of the individual chemical components and their interaction with each other, temperature, and the air exchange rate. Increases in temperature and air exchange rate will increase the rate at which a liquid will evaporate. After evaporation occurs, the

vapors will be transported to the ambient air via the air exchange as discussed above.

(c) VOCs are Adsorbed on Surfaces and Subsequently Desorbed and Transported through Air Exchange:

Before being transported to the ambient air, VOCs may be adsorbed onto surfaces such as walls, carpets, and furniture. These surfaces are known as "sinks". Studies have shown that organic vapors adsorbed by sinks are reemitted. In a study by Tichenor, samples of glass, ceiling tile, carpet, painted wallboard, and upholstery were exposed to concentrations of vapor phase organic compounds in a test chamber. The chamber was supplied with clean air at the rate of 1 air change per hour (ACH) until the start of the test when part of the clean air flow was replaced by a flow containing the test organic vapor, during which adsorption occurred. After 48 hours, the flow containing the test organic vapor was replaced with clean air, starting the desorption phase of the test. The study showed that "common indoor materials were found to adsorb and subsequently re-emit vapor phase organic compounds" (Tichenor, et. al.). After desorption has occurred, volatile organics are available for transport to the ambient air via air exchange.

(d) Chemical Reactions Transform VOCs:

In some cases, VOCs may be involved in chemical reactions which alter their composition. Depending on the chemical reaction, the VOC reactants may be converted to non-VOC materials or different VOCs. These effects have been considered during the development of the consumer products regulation.

As an example, some adhesives contain VOCs that undergo a chemical reaction upon exposure to air or moisture. For instance, cyanoacrylate adhesives polymerize on exposure to moisture on the surface of the substance, transforming most of the VOCs in these products to a nonvolatile material. Another example is the "down-the-drain" products. Depending on the chemical compounds and the use of the product, some of the VOCs in products such as laundry detergents and hand dishwashing soaps may be biodegraded by microorganisms in the sewer system or wastewater treatment facility. A more detailed discussion of this subject may be found in the "Issues" section of the Technical Support Document.

## B. CONSUMER PRODUCT EFFICACY

The issue has been raised that the efficacy of reformulated products will be less than that of the existing "non-complying" products and therefore, consumers will use more of the reformulated products and VOC emissions may actually increase.

What is product efficacy and how is it defined? To define product efficacy is not a simple task. According to CSMA "The 'efficacy' of most consumer products consists not just of a single measurable factor, but of a number of factors, some but not all of which can be quantitatively and linearly measured and compared....For some products, there are standard quantitative industry methods for evaluating some of these factors, but in



most cases there are none, only proprietary methodologies developed and employed by individual manufacturers." (CSMA, 1991) Another manufacturer states "Most manufacturers consider their test methods proprietary information and part of their competitive advantage over other companies." (Procter & Gamble, 1991) Other manufacturers believe that the product with the greatest consumer acceptance (e.g. highest market share) determines the efficacy for a particular product category or that consumer's purchase decisions are the ultimate and unappealable test of product efficacy.

Relying on consumer acceptance may be one indication that a product is efficacious, however, there are many other factors that influence a consumer's buying decision. Consumer's buying habits are often influenced by such factors as product marketing, advertising, cost, promotions, fragrance, and product convenience; therefore, consumer acceptance alone would not necessarily demonstrate product efficacy. A market leader is not the market leader only because of product performance testing that is conducted in the company laboratory, but is a function of many factors.

Since there are often no industry accepted standards on which to evaluate the efficacy of reformulated products, the staff must rely upon the information provided in the ARB consumer product survey and information provided by consumer product manufacturers. The staff believe that the reformulated products will be at least as efficacious as existing products. There are a number of existing products that already meet the proposed standards and that, combined, have sufficient commercial presence to demonstrate consumer acceptance. The staff believes that this is strong evidence that it is possible to reformulate non-complying products without sacrificing efficacy. In addition, an inefficacious reformulated product will likely fail in the marketplace and therefore not result in a significant increase in VOC emissions due to increased usage.

### C. TOXIC AIR CONTAMINANTS

Toxic air contaminants are not addressed in this Consumer Products Regulation. However, manufacturers need to be aware that restrictions may be placed on these compounds in the future. When products are reformulated to comply with the Consumer Products Regulation, manufacturers should be aware that there is an economic risk associated with replacing volatile organic compounds (VOCs) with compounds that have been identified as TACs or are scheduled for review in the future. These manufacturers may face the need to reformulate again in the future to replace the toxic air contaminants. The ARB staff will do its best to apprise manufacturers of regulatory plans so manufacturers can make sound business decisions.

Toxic air contaminants (TACs) are identified under the AB 1807 process. Under this process, the Air Resources Board and the Office of Environmental Health Hazard Assessment develop a comprehensive report on the health risk associated with a compound. After public review and comment, the report is then submitted to the Scientific Review Panel (SRP), a panel of experts in various scientific fields. The final decision regarding the listing of a candidate substance is made by the Board at a public hearing. After identification as a toxic air contaminant, the control phase begins. During

this phase, sources of TACs are evaluated for consideration for control. If found appropriate, control measures are developed by staff and are submitted to the ARB for consideration for adoption into the California Code of Regulations.

Currently, there are sixteen substances that have been identified as toxic air contaminants. These substances are listed in Table 12 below.

Table 12  
Toxic Air Contaminants

Asbestos	Ethylene dibromide
Benzene	Ethylene dichloride
Cadmium (metallic cadmium and cadmium compounds)	Ethylene oxide
Carbon tetrachloride	Inorganic Arsenic
Chlorinated dioxins and dibenzofurans (15 species)	Methylene chloride
Chloroform	Nickel and nickel compounds
Chromium VI	Perchloroethylene
	Trichloroethylene
	Vinyl chloride

Among the substances that may be of concern to consumer product manufacturers, are methylene chloride and perchloroethylene both which have been identified as TACs and are used in some consumer products, particularly the automotive care products.

#### References:

Chemical Specialties Manufacturers Association (CSMA), Letter of July 23, 1991, pp. 29-30.

National Research Council (NCR), (1981), Indoor Pollutants, National Academy Press, Washington, D.C.

The Procter & Gamble Company, Letter of July 26, 1991.

Tichenor, Bruce A., Zhishi Guo, Dunn, James E., Sparks, Leslie E., Mason, Mark A. (1991) "The Interaction of Vapour Phase Organic Compounds with Indoor Sinks," Indoor Air, Vol. 1, pp. 23-25.

## VII.

### PRODUCT CATEGORY ISSUES

#### A. 1,1,1,-TRICHLOROETHANE

Title VI of the Federal Clean Air Act (FCAA) requires the phase-out of production of class I and II stratospheric ozone depleting compounds (ODC). Class I compounds are substances that have the highest ozone-depletion potential (ODP), a measure of the relative ability of a compound to deplete the stratospheric ozone layer. Class II ODCs are any other substances that the EPA determines or anticipates to contribute to the depletion of the stratospheric ozone layer. Title VI also requires that the production of 1,1,1-trichloroethane (TCA), a class I compound, be terminated by January 1, 2002. However, limited production of TCA for essential use can be allowed to continue until January 1, 2005, if the EPA determines that such allowance is necessary and is consistent with the Montreal Protocol. The phase-out of TCA begins in 1993, and gradually progressive cuts in production levels will be implemented until production is terminated. TCA is a compound that, under the definition of VOC, is considered to be negligibly photochemically reactive. Since there are many products that use TCA its phase-out may have a significant impact on consumer product manufacturers and the potential exists, that if manufacturers replace TCA with VOCs, the emissions of VOCs may increase.

#### 1. How Extensively is TCA Utilized in Consumer Products?

TCA is used extensively in automotive, institutional and industrial, and household aerosol products. An estimate of domestic consumption of TCA in aerosol use shows that in 1987 approximately 25 million pounds are used in automotive and industrial products and approximately 14 million pounds are used in household products. (ICF) TCA is used in aerosol products because of advantages such as non-flammability, high stability, adequate solvency, low surface tension and viscosity for forming small droplets, and high evaporation rate. (ICF) Products reported in the ARB survey that significantly utilize TCA account for approximately 5 million pounds per year of TCA emissions. These products are brake cleaners, carburetor choke

cleaners, lubricants, insecticide foggers, wasp and hornet insecticides, fabric protectants, and spot and stain removers. The staff estimated the TCA emissions for these products by adjusting the total exempt solvent content summed from the ARB survey, to the average TCA content in these products. For example, staff multiplied the total exempt solvent content for brake cleaners by 80 percent to obtain the TCA emissions because the average exempt solvent content in this product comprises of 80 percent TCA and 20 percent methylene chloride.

## 2. Will TCA be Phased-out early?

Sections 606, 608, and 610 in Title VI of the FCAA give EPA the authority to implement early phase-out of ODCs. The staff discussed with EPA's Division of Global Change the legislative intent and the regulatory plans for these sections. According to EPA's current interpretation of the FCAA, section 606 gives EPA a broad authority to accelerate the phase-out schedule of any class I and class II ODCs. However, EPA is to implement such actions only if significant scientific evidence shows that the schedule acceleration is needed to protect human health and the environment, or if the Montreal Protocol phase-out schedule is modified to be more stringent than the FCAA. The EPA staff believes that section 606 authority will unlikely be applied to TCA because it is a relatively low ODP class I compound, and no new data suggests that it may be more harmful than currently believed. In addition, the likelihood that the Montreal Protocol phase-out schedule for TCA will become more stringent than the FCAA is small, especially when the FCAA is currently the more stringent of the two. Section 608 does not apply to TCA because it addresses mainly the use, disposal and recycling of ODC in household appliances and industrial refrigeration processes. Section 610 does not apply to TCA because it addresses non-essential uses. Regulation for section 610 will be adopted in 1991 to ban hydrochlorofluorocarbon use in products such as party streamers and noise horns. (EPA)

## 3. What is the Potential Impact on VOC emissions from TCA Phase-out?

The total VOC emissions of products reported in the survey that currently utilize TCA is approximately 7 million pounds per year. If TCA is replaced with VOC at a 1 to 1 ratio, the emissions from these products could increase by 5 million pounds per year or 70 percent.

## 4. How will Proposed VOC Standards Prevent Emissions Increase?

Results from the survey show that products in the "TCA product" categories often include high VOC and low VOC content products that do not utilize TCA or any other exempt solvents. For these categories, staff have proposed VOC standards that allow the "compliance" of those low VOC products that do not contain TCA or any other exempt solvents. In the fabric protectants category, the survey results do not show any low VOC products that do not contain exempt solvent. For this category, standards are proposed at levels that industry has indicated to be the lowest product VOC content that can be formulated without exempt solvents. (3M) The staff

believe that compliance with these standards will have dual impacts on VOC emissions. First, the standards will reduce VOC emissions from products having VOC contents above the limit. Additionally, the standards will limit the amount of VOC that can be used to replace the TCA in "compliant" TCA containing products. This limitation would therefore prevent significant VOC emission increases from categories with products that must be reformulated to comply with the TCA phase-out. This "dual" emission reduction and emission limitation applies to Phase II categories of brake cleaner, insecticide fogger, wasp and hornet insecticide, carburetor and choke cleaner. The staff believes that both the proposed standards, which are proposed at VOC levels that do not require the use of 1,1,1-TCA to meet the standard, and the provision that prohibits any new use of ozone depleting compounds but allows for the continued use in existing products, does not conflict with the TCA phase-out. The "no new use" provision for ODC in this regulation precludes any increase in TCA use in new products. The phase-out schedule, as mentioned earlier, will be gradual, giving companies time to incorporate low VOC technologies.

#### 5. Are There Other Benefits to Substituting TCA with Low VOC Alternatives?

In the past, companies have replaced TCA with other solvent or water-based systems in order to reduce ingredient costs. (ICF) With the phase-out, companies are again forced to replace TCA. While some VOC replacements such as hydrocarbon solvents and perchloroethylene (PERC) seem to be natural candidates in terms of solvent properties, they present problems in terms of health and safety risks.

One of the most important qualities that TCA provides for aerosol formulations is non-flammability. This quality is especially crucial in household products, where consequences from safety liabilities can be tremendous and marketing of products with "extremely flammable" labels is undesirable. (Johnsen) In addition to being a safety hazard for the users, flammability also impact warehouse safety and warehousing costs. With strict standards defined in the National Fire Protection Association Code 30B, warehouses storing highly flammable VOC content aerosols are required to install expensive fire protection equipment or risk losing their insurance. (Ortho) The replacement of TCA with a flammable VOC can expose companies and their products to all of the above risks and costs.

Replacement of TCA with PERC offers similar advantages in non-flammability. However, PERC presents additional risks with its toxicity. PERC has been listed by the Board as a toxic air contaminant. Similarly, compounds found in aliphatic and aromatic solvents, such as hexane, toluene, and xylene, are all hazardous air pollutants identified in the FCAA.

Concerns about the health, safety and environmental hazards with VOC replacements for TCA have prompted many companies to seek or develop low VOC water-based alternatives. S.C. Johnson, the major marketer of insecticides in the country, adopted a company policy to incorporate water-based technology. The largest manufacturer of fabric protectants, 3M, has taken the initiative to develop low VOC products in this category that have no

historical usage of water-based technologies. Industry representatives have stated that aside from the health, safety, and environmental benefits, low VOC water-based systems can also provide long term cost savings. (Ortho) Companies utilizing water-based systems can lower ingredient cost and decrease their reliance on the supply of petroleum based products.

The staff believe that the standards proposed for the TCA products in Phase II is consistent with industry goals in the phase-out of TCA. We believe that the standards will reduce VOC emissions from current high VOC products, limit emission increases that may result from TCA phase-out, and in addition proliferate technologies that bring about safer products for consumers.

## **B. AEROSOL DISINFECTANTS**

One manufacturer of aerosol disinfectants (L&F Products) has questioned the need for and appropriateness of regulating disinfectants, especially aerosol disinfectants. They have stated that these products provide an invaluable health benefit to the public and should therefore be exempted from the regulation.

Based on extensive consultation with infection control experts from the California Department of Health Services (DHS), information obtained from the 1991 ARB VOC and Hard-Surface Disinfectant Usage surveys, current literature and advice from other infection control experts, the staff have concluded that emissions from aerosol disinfectants can be reduced without adversely affecting the supply of effective disinfectants for consumer use. The staff's analysis involved a review of the information obtained from the sources described above and is summarized below; greater details regarding these findings can be found in the Technical Support Document (TSD).

### **1. Why regulate the VOC content in aerosol disinfectants?**

The proposed requirements will affect only aerosol disinfectants. This means that no adverse impacts should be felt by liquid, pump spray, solid and other nonaerosol disinfectants. On a mass basis, nonaerosol disinfectants comprise approximately 99 percent of the total combined consumer and industrial/institutional (I&I) market, with aerosol disinfectants comprising the remaining 1 percent. However, aerosol disinfectants emit a disproportionately large percent of the emissions (40 percent) for the disinfectant category (1991 ARB VOC Survey). While reformulation of aerosol disinfectants is possible and can result in emission reductions, there are few, if any, emission reductions available from the nonaerosol products. Few reductions are possible from nonaerosol disinfectants because the vast majority of these products are dilutable concentrates. After the recommended dilution, these products generally have very low VOC content.

Staff's research shows that aerosol disinfectants dominate only in the consumer household market. This finding is supported by the 1991 ARB VOC and Hard-Surface Disinfectant Usage surveys, which show that the majority of I&I consumers use liquid and solid disinfectants. Since these health care facilities have very stringent disinfection requirements, it is reasonable to assume that the nonaerosol disinfectants used by I&I consumers are meeting or exceeding these stringent disinfection requirements. Thus, there are low VOC, readily available nonaerosol disinfectants which can meet stringent disinfection requirements.

Staff's extensive consultation with infection control experts from DHS indicates that no adverse impacts on the effectiveness of aerosol disinfectants are expected. This consultation, supported by information obtained from the two surveys discussed previously and current literature on infection control, indicates that current aerosol disinfectants can be reformulated to meet the 60 percent VOC by weight standard and still achieve stringent hospital-level disinfection required by both I&I and household consumers.

ARB staff estimates that aerosol disinfectants emit approximately 3.8 T/D, with one product comprising approximately 95 percent of the total emissions (1991 ARB VOC Survey). Based on survey data, the proposed standard of 60 percent VOC by weight is expected to achieve a 25 percent reduction in these emissions (1.0 T/D).

2. How would the proposed standard affect the efficacy of aerosol disinfectants, especially in regard to transmission of infectious diseases such as AIDS and infectious diarrhea?

The majority of aerosol disinfectants is based on a mixture of alcohol (ethanol or isopropanol) with water and a secondary active ingredient (e.g., o-phenylphenol, quaternary ammonium compound) propelled by either a liquefied hydrocarbon (isobutane, propane) or compressed gas (CO<sub>2</sub>) propellant. The alcohol, hydrocarbon propellant, and trace amounts of fragrance comprise the product's VOC. The amount of alcohol in existing products ranges from about 20 to 80 percent by weight.

Standardized testing procedures for determining the effectiveness of disinfectants are based on showing killing action against select target organisms. For instance, a disinfectant that kills Staphylococcus aureus, Salmonella choleraesuis, Pseudomonas aeruginosa, Mycobacterium tuberculosis var. bovis, and Trycophyton mentagrophytes is rated as a fungicidal and tuberculocidal hospital disinfectant (FIFRA). Disinfectants with this rating are also known as "intermediate-level" disinfectants by the infection control community (CDC). Nearly all alcohol-based aerosol disinfectants have this rating, regardless of alcohol content. Intermediate- and low-level disinfectants (i.e., hospital disinfectants without tuberculocidal claims) are recommended by federal public health agencies for preventing the

spread of Human Immunodeficiency Virus (HIV, the virus that causes AIDS) and hepatitis-B virus (causes serum hepatitis) in health care workers (CDC).

Current literature demonstrates that most existing aerosol and liquid disinfectants formulated with 60 percent by weight ethanol will provide hospital-level disinfection with tuberculocidal and fungicidal activity. Such disinfectants are implicitly considered to be effective against virtually all vegetative bacteria and fungi and nearly all lipophilic and hydrophilic viruses. However, for ethanol-based disinfectants, L&F Products has raised the question of whether a 60 percent ethanol by weight disinfectant can inactivate the group of hydrophilic viruses known as picornaviruses. Picornaviruses are a group of small (20-30 nanometers) viruses which contain no lipids and which do not react with lipids (Block). Such viruses include Polioviruses, Cocksackieviruses and Echoviruses.

Unfortunately, EPA has not selected a target organism for demonstrating broad-spectrum virucidal activity. L&F Products, makers of Lysoi Disinfectant Spray, claim that polio virus (type 1), because of its high resistance to germicides, should be considered as a virucidal standard (L&F). This is supported somewhat by recent (Rutala) and past studies (Klein and Deforest; Christensen, R.P.). Since there is no existing standard using polio virus, predictions of what level of VOC will be effective against polio virus are, of necessity, predicated on well-documented past studies.

After consultation with DHS infection control staff, ARB staff assumed that polio virus is a reasonable standard to show efficacy against hydrophilic viruses. With this in mind, staff reviewed current literature to determine what levels of VOC are necessary to inactivate this virus. To date, studies conducted to determine germicidal effectiveness against this virus have been conflicting. For example, both Klein and Christensen, in testing ethanol-based disinfectants (with and without o-phenylphenol), show that the minimum ethanol content required to inactivate the polio virus is 70 percent by volume (62 percent by weight). Other studies provided by L&F Products indicate that 80 percent ethanol by weight will definitely inactivate polio virus, while 53 percent ethanol will definitely not work against polio virus. Although the L&F data shows that 80 percent ethanol by weight will work against polio virus, it does not conclusively show that 80 percent ethanol by weight is the minimum level required. Since 70 percent ethanol by volume (62 percent by weight, as delivered) has been shown by studies to inactivate polio virus, the standard of 60 percent VOC by weight in the can was chosen by staff to enable complying products to deliver a spray onto the surface with 70 percent ethanol by volume, at a minimum.

According to the U.S. Bureau of Standards, 70 percent by volume ethanol is equivalent to 62 percent ethanol by weight for the liquid film on the sprayed surface (USBS). Staff performed a propellant-loss analysis to show that a 50 percent to 60 percent ethanol by weight aerosol disinfectant in the can, when sprayed, would concentrate to over 70% by volume after the propellant fraction has flashed off and evaporated. Thus, a complying



product with 60 percent VOC in the can should be able to deliver a spray with an effective level of ethanol.

Triangular diagrams are diagrams for three-component solutions which can be used to predict selected physical properties of aerosol disinfectants formulated to meet the standard. For example, according to readily available triangular diagrams (Sanders), a single-phase aerosol disinfectant at approximately 40 psig pressure could be formulated with 60%-10%-30% (ethanol:water:HFC-152a) weight ratios (Figure 5, Point 5). HFC-152a is used in this example because it is a non-VOC propellant which, when used in this suggested formulation, will result in aerosol disinfectants with moderate pressure (40 psig) and medium spray characteristics that are within industry norms for this product. A product formulated in such a way is expected to deliver, after propellant flashoff and evaporation, a disinfectant liquid film to the sprayed surface with an estimated 85 percent ethanol by weight (90 percent by volume). From the earlier discussion, it is clear that this level of delivered ethanol is significantly higher than the 62 percent ethanol by weight (70 percent by volume) that has been shown by past and current studies to inactivate the polio virus.

Manufacturers have raised the point that ethanol would evaporate at a faster rate when aerosolized; thus, a level of ethanol greater than 62 percent by weight (70 percent by volume) is needed to account for additional evaporation of ethanol. While staff agree that sufficient "extra" ethanol is needed to allow for a margin of error, staff's analysis shows that sufficient allowance for error can be achieved while still complying with the standard. To illustrate this, it must be noted that, given the same set of product and ambient conditions (e.g. droplet size distribution, ambient temperature), the evaporation rate of ethanol in aerosolized disinfectant droplets is at a maximum when only ethanol, water and propellants are contained in the aerosol product. However, existing aerosol disinfectants employ several methods to reduce ethanol evaporation. Current aerosol disinfectants such as Lysol Disinfectant Spray and Citrace Hospital Disinfectant are required to provide germ-killing action for at least ten minutes on the surface as stipulated by the EPA (AOAC). To stay viable on the sprayed surface for ten minutes, these existing aerosol disinfectants employ both a combination of a "wet" (medium to coarse droplets) spray along with evaporation inhibitors to reduce the rate of evaporation of the ethanol (Christensen). Since this technology is currently being used, staff fully expects manufacturers to use the same technology to reduce the evaporation of ethanol in complying aerosol disinfectants.

In addition, the complying formulation based on HFC-152a described previously contains a significantly greater ethanol/water concentration (85 percent ethanol by weight) than the 62 percent by weight shown to be effective against polio virus. Because of this, it is reasonable to expect that the high ethanol/water ratio (85 percent ethanol by weight) in the disinfectant concentrate, in combination with the evaporation-reducing techniques described above, should result in a complying aerosol disinfectant that will deliver a spray with sufficient allowance to account for any droplet evaporation of ethanol that may occur.

It should be noted that the suggested formulation discussed above is not intended to be the only possible formulation for compliance with a 60 percent VOC by weight standard: it is merely intended to demonstrate that a reformulation is possible. Depending on the choice of propellant blends, desired spray characteristics, and ethanol/water ratio, a manufacturer can develop other formulations which can also meet the VOC standard while providing an ethanol product with over 70 percent ethanol by volume. From this information, it appears that an aerosol disinfectant can be formulated to have 60 percent by weight total VOC in the can and still result in a 70 percent by volume ethanol product on the sprayed surface. Since disinfectants which deliver a product with 70 percent ethanol by volume have been shown to inactivate polio virus and nearly all vegetative microorganisms, it can be predicted that such a product would be effective against most vegetative bacteria, pathogenic fungi and viruses.

Based on the available information presented above and in the TSD, the staff expects no adverse impacts on the effectiveness of aerosol disinfectants. For example, it is well documented that the Human Immunodeficiency Virus (HIV), which causes Acquired ImmunoDeficiency Syndrome (AIDS), is a very fragile virus outside of the human host. Levels of ethanol much lower than those found in current aerosol disinfectants are effective in killing this virus. Similarly, the staff expects no adverse impacts on aerosol disinfectants' ability to inactivate fecal-oral viruses such as rotavirus. Currently, there are aerosol and liquid disinfectants with levels of ethanol below 60 percent by weight which are registered with FIFRA for rotavirus activity. Rotavirus is believed to be a major cause of infectious diarrhea in young children (L&F).

#### Vapor Pressures of HFC-152a/Ethanol/Water Solutions at 70°F\*

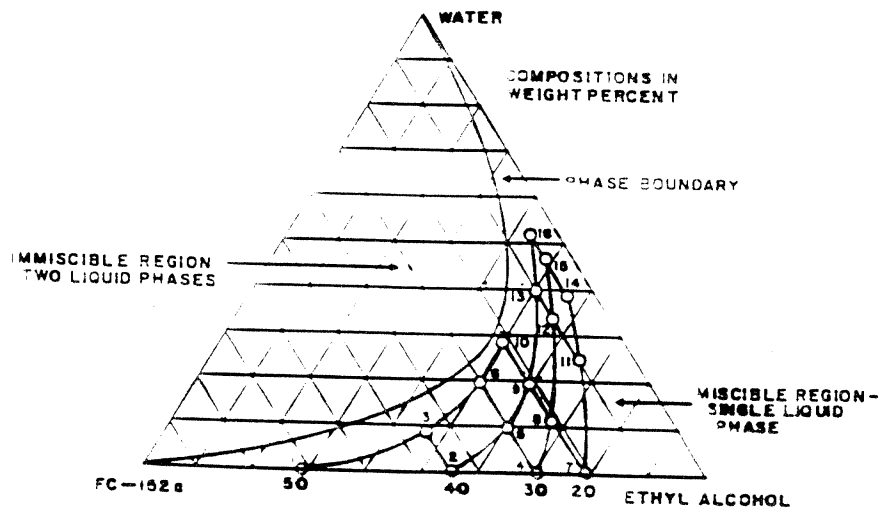


Figure 5

\* Reprinted from Sanders, Paul A., Handbook of Aerosol Technology, 2nd Ed., p. 155.

3. Why was 60 percent by weight chosen as the standard for aerosol disinfectants?

As explained above, 60 percent by weight VOC represents a level, in staff's opinion, where emission reductions can be achieved without compromising the product's effectiveness. At 60 percent by weight VOC, the ARB VOC survey shows that 41 aerosol disinfectants would comply. If the standard were to apply to nonaerosol disinfectants, virtually all of the over 500 nonaerosol disinfectants in the survey would also comply after the recommended dilution.

4. How can an aerosol disinfectant manufacturer comply with this standard?

As discussed previously, there are several ways a manufacturer can comply with the standard such that the total VOC content is at or below 60% by weight: (1) formulate a proper balance of alcohol/water/propellant ratio such that compliance is achieved while maintaining product integrity, (2) change propellant to non-VOC propellant such as HFC-152a, (4) increase the amount of other active ingredients, such as the phenols and/or quaternary ammonium compounds, to achieve greater disinfection while allowing a reduction in VOC content, (5) package the product into a pump spray, or (6) redesign product into an innovative package such that it emits fewer emissions.

5. How does staff provide assurance that there will not be a health problem from compliance with the standard?

In effect, the staff's proposed standard challenges the industry to maintain the current disease control benefits of aerosol disinfectants, while reducing the contribution these products now make to California's serious air quality problems. The staff intends to recommend to the Board that ARB and DHS staff jointly evaluate the progress and reasonable efforts made by manufacturers in developing viable and complying aerosol disinfectants. In determining what possible impacts the standard may have on the health benefits of these products, both ARB and DHS staff will evaluate the effectiveness of products formulated to comply with the standard and achieve intermediate-level, hospital disinfection according to the products' ability to kill or inactivate Staphylococcus aureus, Salmonella choleraesuis, Pseudomonas aeruginosa, Mycobacterium tuberculosis var. bovis, Trycophyton mentagrophytes, and any target organism or organisms which the EPA determines by notice in the Federal Register as a general-purpose virucidal indicator(s) for showing activity against most hydrophilic and/or lipophilic viruses. ARB and DHS staff will jointly report to the Board on the progress of manufacturers in developing complying products which meet this criteria.

### C. PERSONAL FRAGRANCE PRODUCTS

In the current proposed amendments to the regulation, ARB staff are proposing to include VOC limits for personal fragrance products. Industry representatives have been very vocal about their opposition and claim that

the standards being proposed are not technologically and commercially feasible, will adversely impact the retail business in California, stifle creativity of a unique art form and should not be implemented since personal fragrance products, as a category are responsible for de minimus emissions when compared to other products.

The staff believe it is appropriate to include standards in the regulation to achieve emission reductions from this category. It is important to remember that individually many product categories in the consumer product arena may have relatively small emissions, however when considered in the aggregate the emissions are significant. The personal fragrance category is not small when compared to other categories of consumer products. Staff estimate the emissions from personal fragrance products to be close to 6 tons per day in California. Last year, the Board established standards for several categories that had emissions less than perfumes and colognes. Out of the 16 products regulated in Phase I, 13 products had emissions less than that of the emissions from personal fragrance products being considered this year. To be able to achieve the "maximum feasible" emission reductions required by law, it is necessary to look at all categories - both large and small in terms of emissions.

Section 41752 of Health and Safety Code require the Board to adopt regulations that are technologically and commercially feasible. The current staff proposal includes standards for personal fragrance products that staff believe are technologically and commercially feasible. In recognition of the concerns raised by industry regarding the ability to reformulate existing products and maintain the identical scent, the staff is proposing, at this time, to exclude from regulation all perfumes, colognes and toilet waters that are already on the market and only require new perfumes, colognes, and toilet waters to formulate to a 70 percent VOC standard. This exclusion for existing products reflects the fact that the staff believes additional study and analysis of industry concerns is needed before standards are proposed for existing perfumes, colognes, and toilet waters. Standards may be proposed for the existing products at some future date if further study indicates that standards are technologically and commercially feasible. However, all aftershaves and body splash products, both existing and new, would be required to meet a 60 percent VOC standard. Based on our survey there are already many products in the market place today that can meet these standards. Change will be necessary - perfumers may need to adjust the palette of fragrance oils that they use to focus more on those that can tolerate higher levels of water, or may deliver the fragrance product in a different form. This should not be viewed as a negative event, however, since there are many ways to produce a fragrance product that is pleasing to the olfactory senses.

The staff has held numerous meetings with the personal fragrance industry associations and with some individual companies. During the time in which this report was being finalized, the personal fragrance industry brought a proposal to staff for consideration. The proposal addressed industry concerns regarding the category definitions, proposed exemptions, and proposed VOC levels. The staff are evaluating the proposal and are

continuing to consult with representatives from the personal fragrance industry. The staff will propose amendments to the regulation if an alternative approach can be developed that will address industry's concerns and meet the requirements of the California Clean Air Act.

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